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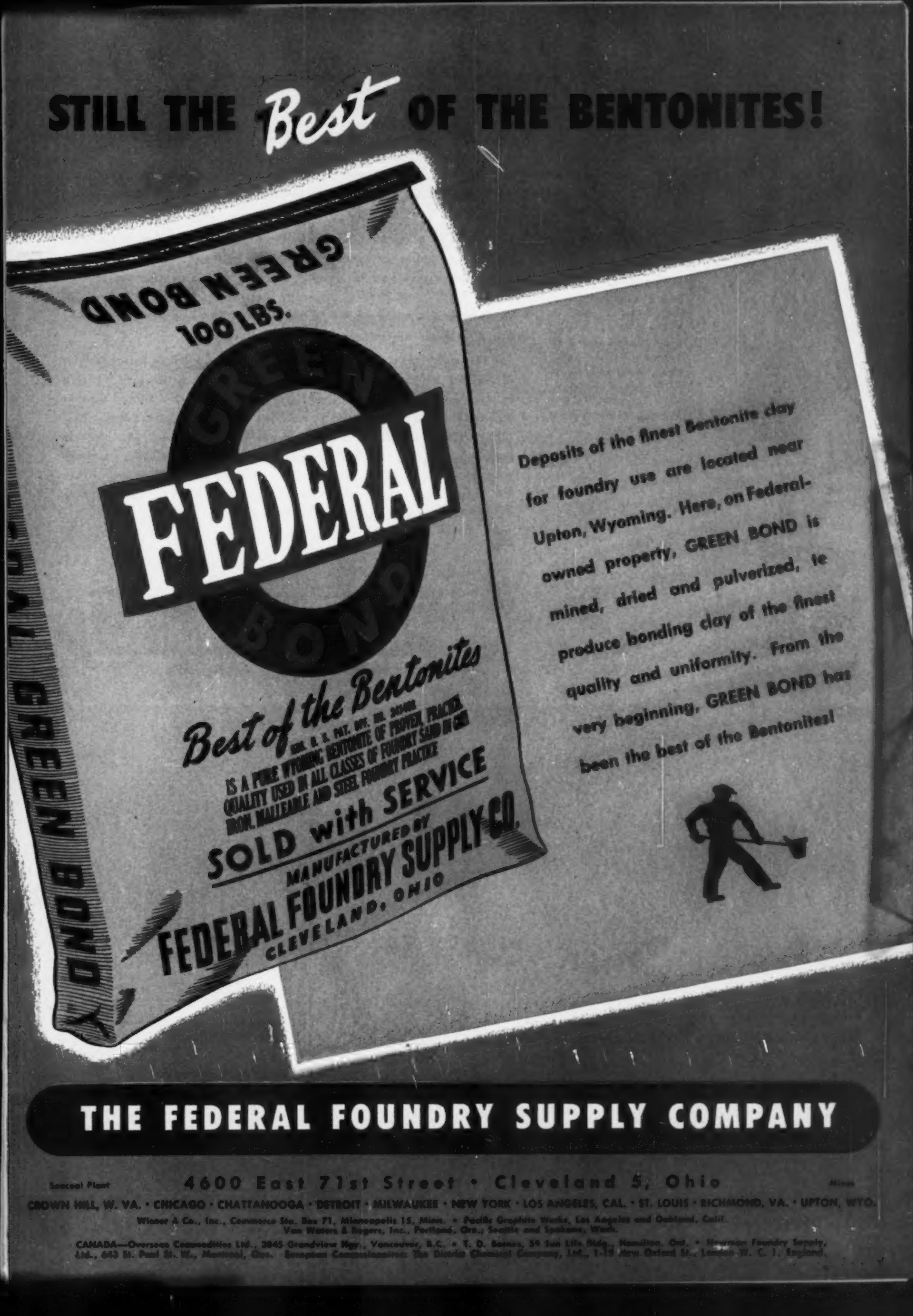

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VOLUME XX, NUMBER 5

November, 1951

American Foundryman

Official publication of American Foundrymen's Society

An asbestos disc at the bottom of the large cylindrical pouring basin keeps the aluminum alloy from filling the mold plaster until air pressure is applied. When the temperature falls to the proper level, as measured by an immersion pyrometer, a pressure head will be clamped on the cylinder and air at up to 100 psi will force the aluminum through the asbestos paper into every detail of the mold cavity. Photo made at Scientific Cast Products Corp., Chicago, during production of patterns for the 1952 A.F.S. Apprentice Contest.

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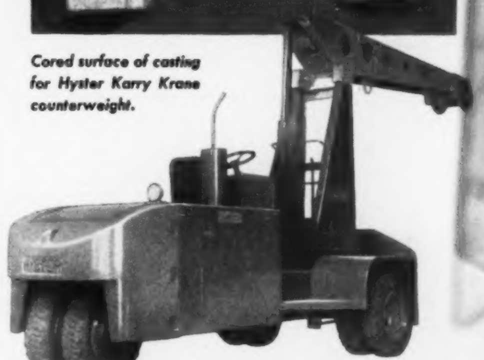

Hyster Karry Krane showing the large casting which counterbalances crane boom.

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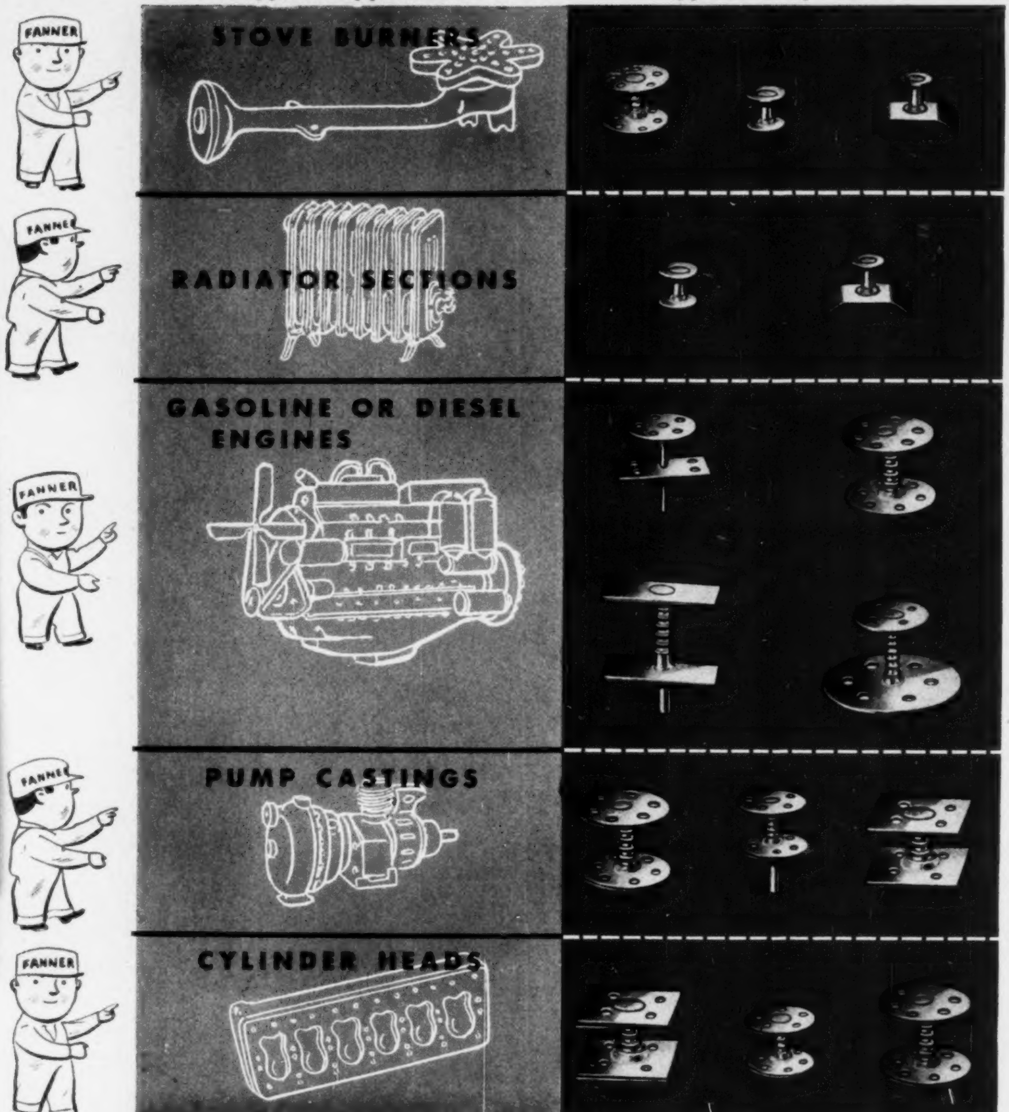

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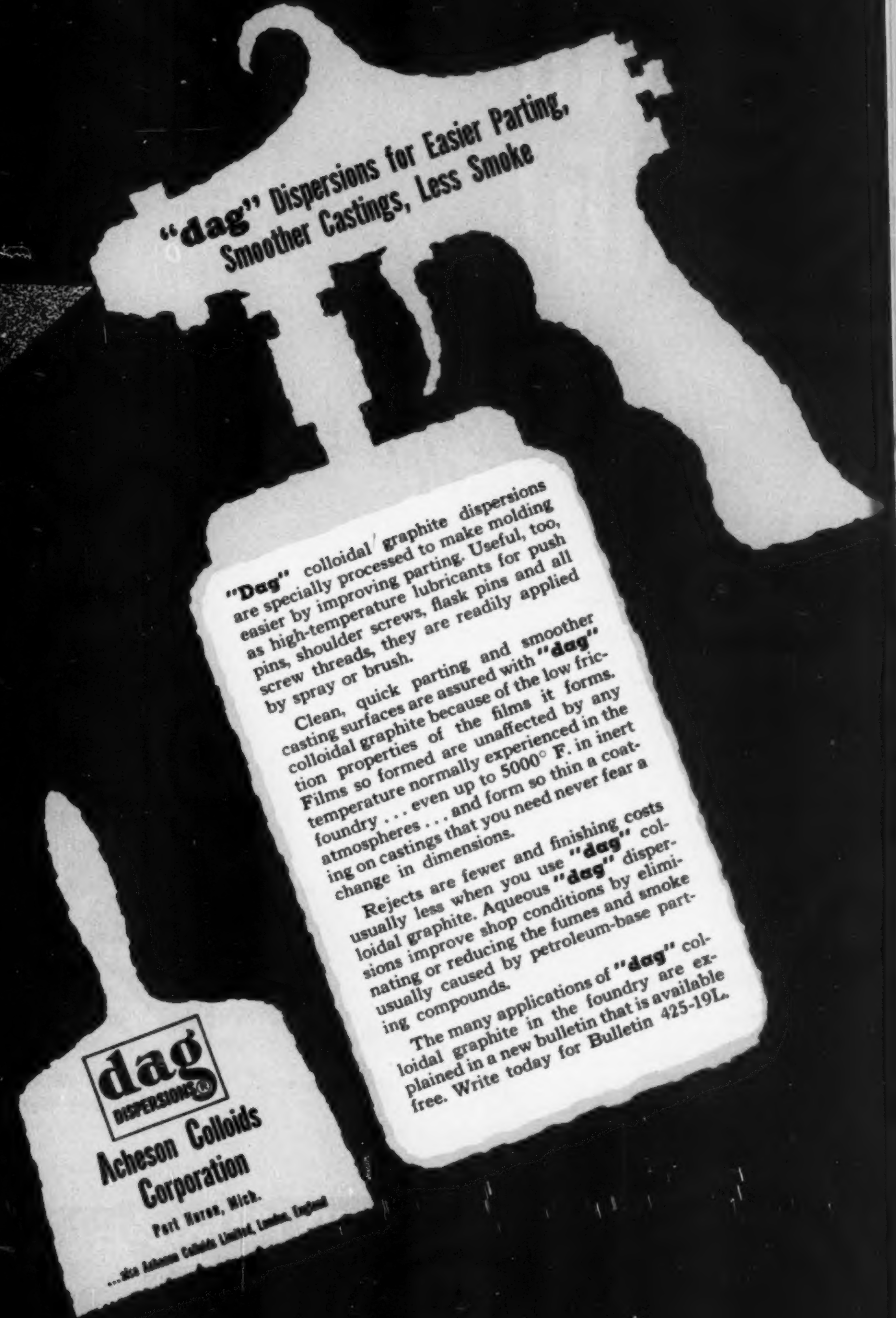
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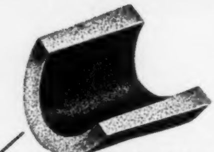
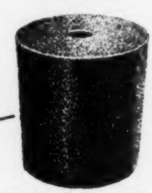
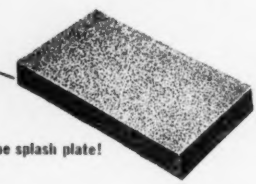


For the cinder notch liner!

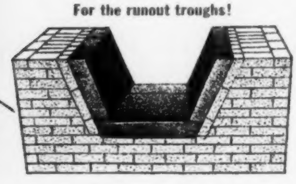


For the cinder notch plug!



For the splash plate!

For the runout troughs!



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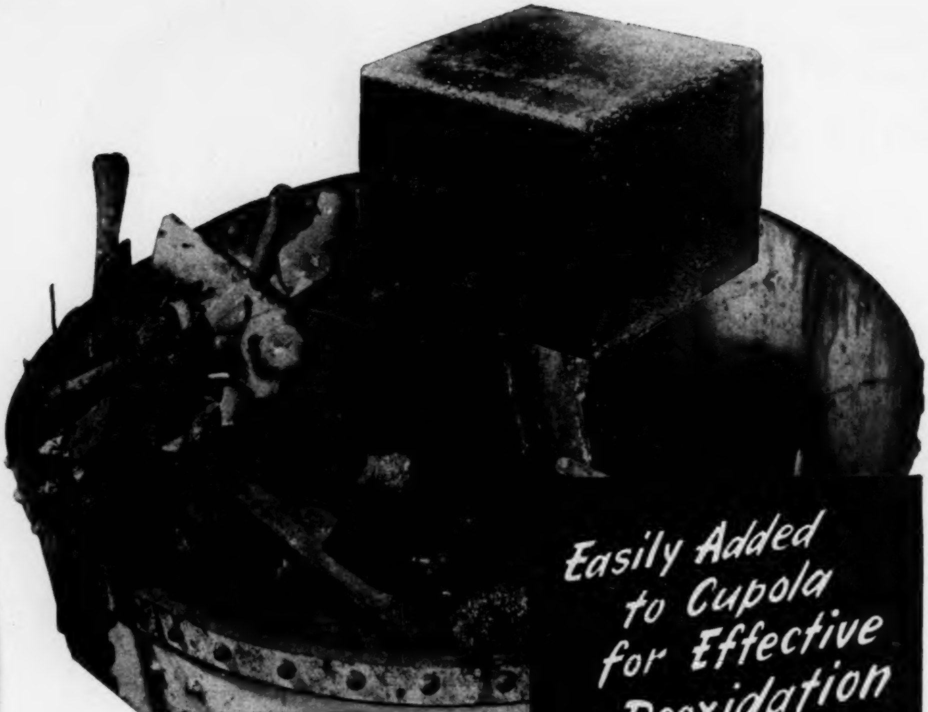

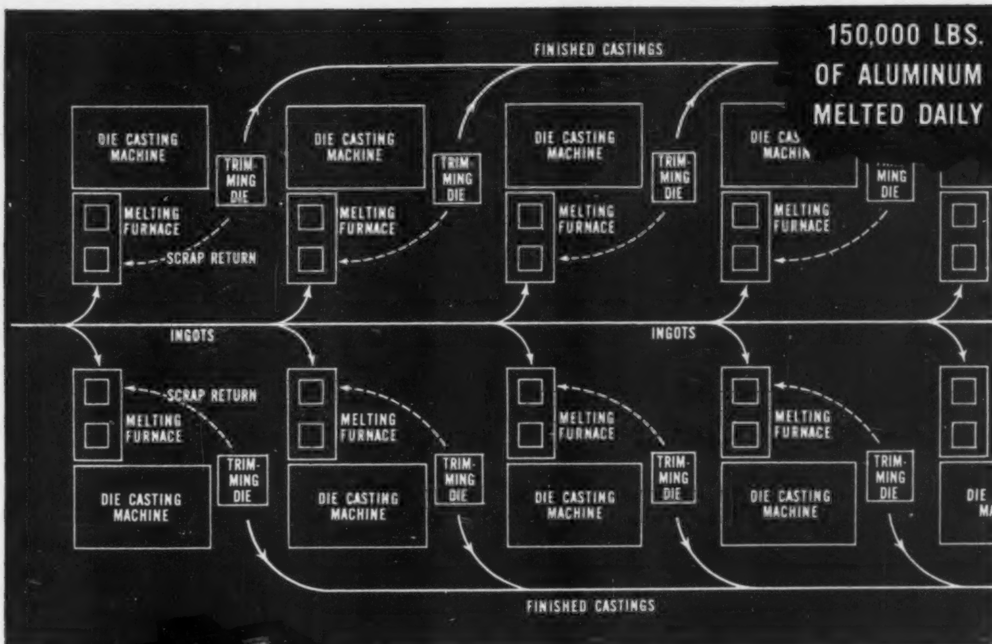

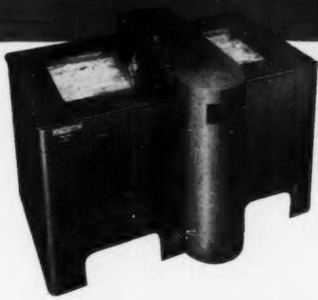

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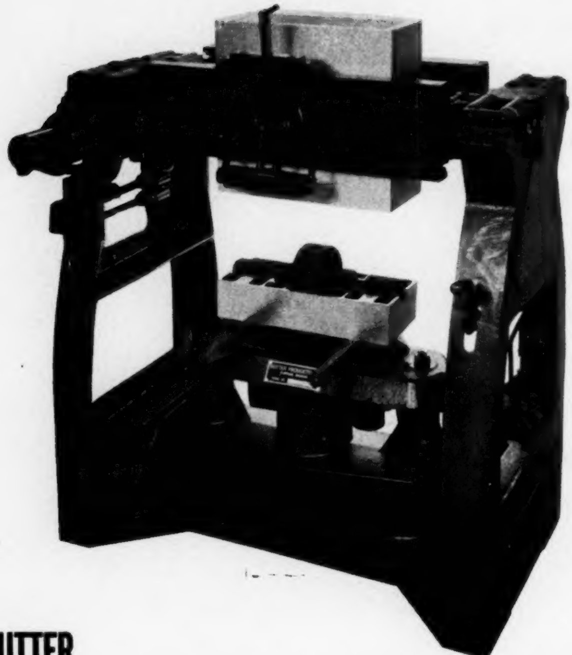

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Sutter Automatic Core Draw Machines are in use in a number of leading U.S. foundries. If you are interested in seeing one in operation, we will gladly arrange for you to visit the nearest one in your locality.

The Sutter Core Draw Machine is completely automatic. The operator needs only to push the start button and remove the draw cores from the table. Since this automatic cycle takes only six seconds—from clamping of the dryer until the drawn core rests on the table—production is increased 300% to 400%. At the same time, because every core is drawn automatically and *uniformly*, even unskilled operators can maintain peak output on the most complicated cores.

The Sutter Core Draw Machine is equipped with a double rollover frame so that the operator can blow one core while another is being drawn. Power-rollover and draw have speed control for regulation to any production cycle. Thus, these versatile machines may be used with an automatic core blower—on either or both sides—where the operator blows and draws cores or in a loop set-up where cores are hand drawn.

Four standard sizes meet the requirements of most foundry applications but specials can be developed for the unusual job. Complete information is contained in Sutter Bulletin "F". Send for it today.

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Quality control and statistical analysis of quality control data are coming to the fore again as they did in World War II. There is a place for quality control in all foundries and statistical quality control — with techniques much simpler than many foundrymen suppose — has a place in more shops than those foundries in which it is now practiced.

QUALITY CONTROL SERVES ALL FOUNDRIES

MANY FOUNDRYMEN practice some kind of quality control. Improvement of process and product is their goal as they strive for

–less foundry scrap
–higher productivity
–lower operating costs
–better customer relations
–minimum returns of castings by customers.

Quality control helps in all of these and in addition data can be analyzed or collected by means of published methods, known as statistical quality control, to

–insure lowest possible rejection of satisfactory castings
–guarantee that acceptable lots contain no more than a previously determined proportion of defective castings
–differentiate between apparent and real deviations in quality and thus prevent making unwarranted changes in production methods.

Quality control can be the casual responsibility of most everyone in a shop or it can be highly formalized with the work assigned to a separate individual or department. Regardless of the size of the shop, where formal quality control is practiced it is generally agreed that quality control is a valuable management tool and that those controlling quality should be responsible to top management, not to production.

Formal quality control is for all foundries–large and small. If it seems to have been given greater attention by the larger shops it is not because the smaller turn out a lower quality casting. It is only natural that foundries in which thousands of castings can be produced incorrectly in a few hours if process and raw material are not constantly controlled at critical points should pay more attention to quality control.

The same methods used so commonly by the large shops are easily adapted to serve the small.

Quality control means measurements. "Until you measure, you don't know" is a common expression among physicists. It is equally apt for those responsible for controlling quality. In the foundry, measurements can mean chemical analyses, mechanical tests, sand tests, temperatures, pouring rates, casting weights, air pressures and volumes, raw material weights, casting dimensions and section thicknesses, and so on.

After measurements come records but these are of little significance if not analyzed and acted on immediately as required.

Careful analysis of records by a skilled observer will often reveal trends which can be halted before serious damage to quality has resulted. But few people are skilled enough to interpret correctly and consistently many series of measurements and even skilled men can err in studying data. They can miss something on which action should be taken. They can decide to take action when evidence for it is actually not in the data.

Here's where statistical quality control comes in. Dr. I. W. Burr of Purdue University, writing in AMERICAN FOUNDRYMAN, said: "Statistical quality control can reduce the risks of making a wrong decision . . . [it is] a tool designed for varying data."

Foundrymen not using quality control methods–particularly statistical quality control–should get acquainted with this tool that is flexible enough to serve all foundries.

–Editor.

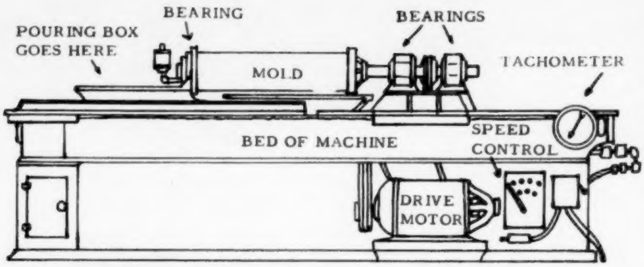

Fig. 1—Sketch of horizontal experimental centrifugal casting machine.

Temperatures observed by thermocouple pyrometry in spinning cylindrical molds and tubular castings gave data to compute the heat transfer coefficient of the discontinuity between casting and mold, and the heat transfer coefficient of mold to air. The heat transfer coefficient of copper centrifugally cast on steel was found to be of the order 50 BTU/hr, sq ft, deg F. The coefficient of mold to air was of the order 14 BTU/hr, sq ft, deg F.

HEAT TRANSFER COEFFICIENTS OF CENTRIFUGAL CASTING

C. L. Register*
H. F. Taylor
and
B. G. Rightmire

Centrifugal casting is an old, well-established art. It is best adapted to the casting of tubular or cylindrical objects although other shapes are also cast in quantity. Molten metal is introduced into a spinning mold; the rotation of the mold, and friction between metal and mold, cause the liquid to be picked up and held in place until freezing is complete.

Little is known of the way in which freezing takes place in a centrifugal casting. Much experimental and analytical work is needed before such an understanding will be possible. Among the important factors for which no published information exists are the coefficients of heat transfer between the metal and the mold, and between the mold and the atmosphere. In this paper an experimental technique for measuring these coefficients is described, together with results that indicate the order of magnitude of numerical values.

Apparatus and Procedure

With pure copper centrifugally cast in a spinning steel mold (Figs. 1 and 2) temperatures were observed in the casting and the mold by thermocouple pyrometry. Copper thus cast was formed into a hollow cylinder 17 in. long, with 5¾ in. OD and 2½ in. ID. The wall thickness of the cylindrical steel mold was 1⅛ in.

Eight couples were used for the initial temperature measurements. Four of these were placed within the wall of the mold; four others were placed in the mold interior so as to be at appropriate points inside the casting. Figure 3 shows the relative position of all couples in a radial direction. All couples were located in the central third of the mold. This central third had been previously found to be free of end effects.

Each group of four couples was located on a helix around and along the cylinder (Fig. 4). The four couples in the mold were located at the various depths shown in Fig. 3. The hot junctions were held in contact with the bottom of a well in the mold (Fig. 5A).

The four couples in the casting were each encased in a quartz shield with the hot junction exposed to the melt. These shields projected into the mold cavity and were fixed at the desired depths (Fig. 5B). These depths are also shown in Fig. 3.

The signals given off by the thermocouples on the rotating mold were transmitted by wire to a commutator and thence to potentiometers (Figs. 4, 6, 7).

The commutator (Figs. 6, 7), designed and fabricated especially for this research, was prompted by prior work done by the United States Air Force at Wright Field.[1] Tests of this commutator showed that no changes were introduced by the commutator into

Fig. 2—Metal poured into the refractory lined pouring box discharges through a spout to the rotating mold.

*The authors are: Lt. Col., Ordnance Corps, U.S. Army, Dept. of Mechanics, U.S. Military Academy; Assoc. Prof. Metallurgy, Massachusetts Institute of Technology; and Asst. Prof. of Mechanical Engineering, Massachusetts Institute of Technology.

Note: Extracted from a Doctorate Thesis of C. L. Register, conducted at the Massachusetts Institute of Technology and Watertown Arsenal, this paper is published with approval of Massachusetts Institute of Technology and the Department of Defense. It does not necessarily represent the views of the Department of Defense.

signals passing through it when the tension in the springs was greater than 25 oz.

As the molten metal entered the mold during casting, one expected that the thermocouple coming in contact with the molten metal would give off a signal showing temperatures in the molten range. This did not occur. Maximum discrepancies of 300 to 400 F below the fusion temperatures were observed.

Tests made with similar shielded thermocouples to determine their performance showed that the trouble was in the shielded thermocouple. Although the hot junction of the couple was not shielded, the metal froze locally on contact with the cold shield when the molten metal was less than 50F above the melting point. By the time the casting was completely solidified, no discrepancies between thermocouple signal and actual temperature existed.

Several castings were made for which temperatures at all eight stations were recorded during a 5- or 6-min spin. Two high-speed electronic recording potentiometers were used. Four stations were recorded on each. Stations were recorded for 5 sec each and then the instruments were hand switched to the next station. Each station was read in rotation every 20 sec.

It was found that at approximately 2 min after the start of pour the mold had reached its peak temperatures, and all four mold stations were within a few degrees of one another and declining together. Likewise, solidification was complete and the temperatures in the casting were within a few degrees of one another; these also had started a steady decline. A typical plot of these conditions is shown in Fig. 8.

One would expect that a couple in the mold near the mold-casting interface would give readings of higher temperatures than a couple located nearer the outside mold-air face. Such did not always happen. The spread of the signals of all couples in the mold would normally not exceed 15 or 20F after 2 min had elapsed from the start of the pour.

This same spread of temperatures in the casting was observed after 2 min from the start of the pour. Local disturbances, local electromotive force sources introduced by coldworking of the lead wires, and temperature gradients of the wire were probable causes for these inversions or other minor discrepancies. Hunsiker[2] also reported this small spread of temperatures in castings after solidification had been completed.

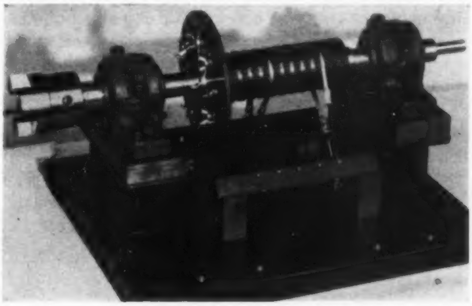

Fig. 6—Rotation of the specially designed commutator is in the direction to produce tension in springs. Spring tension must be maintained to 25 ounces or greater.

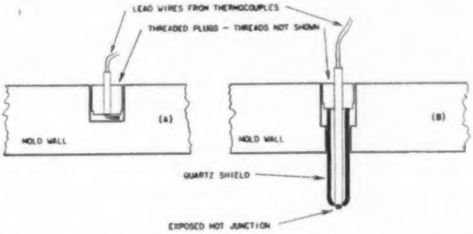

Fig. 5—Schematic drawing shows method of installing thermocouples in the mold wall and the mold interior.

Fig. 4—Thermocouple wires lead off the mold and enter the hollow drive shaft to connect to the commutator.

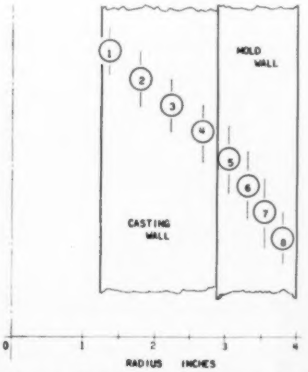

Fig. 3—Relative locations of eight thermocouples, four installed in the mold wall and four in the interior, are shown in the sketch. Locations are in radial direction only.

Since there is only a small spread of temperatures in the values recorded for the casting and the mold in this later period, only one or two stations in each were observed for the work involving bulk temperatures.

Considering the period from 2 to 5 or 6 min after pour started, the over-all heat-transfer coefficient[3] for the mold-casting interface was computed in the following manner. The heat given off during this period by the casting was the product of the weight, the specific heat, and the change in temperature. There was no phase change in the solid state as cooling occurred. This total heat, divided by the time of the observation, gave the rate of heat transfer. This rate, together with the drop in temperature across the mold-casting face, and the area of the face, made it possible to compute the over-all coefficient[3] from the equation:

$$q = UA\triangle T$$

where q is the rate of heat transfer, U is the over-all heat-transfer coefficient, A is the area perpendicular to the heat transfer, and $\triangle T$ is the drop in temperature across the area through which heat flows.

The over-all heat-transfer coefficient between the rotating mold and the air was similarly computed. The heat given off by the exterior mold face was equal to that given off by the casting, plus that given off by the mold mass.

Temperature data which could be used to determine these coefficients were observed only on a portion of many castings made. The data for these castings, together with the resulting computed coefficients, are shown in Fig. 9.

The coefficient for the mold-casting interface of copper cast centrifugally on steel was observed to be in the range of about 50 British thermal units/hour, square foot, degree Fahrenheit (BTU/hr, sq ft, deg F).

Coated Mold Gives Same Result

For one casting only, copper was centrifugally cast on steel coated with a light clay insulating wash. The observed value of the over-all coefficient was of the same order as that for no wash. No effort was made to control the nature of this wash.

The heat-transfer coefficient for the rotating steel mold to air was observed to be in the range of fourteen (14) BTU/hr, sq ft, deg F.

McAdams[3] and Bailey and Lyell[4] indicate that for bare steel pipes at rest, with a diameter of 4½ in., room temperature at about 80F, the heat-transfer coefficient is approximately 9½ BTU/hr, sq ft, deg F. The result

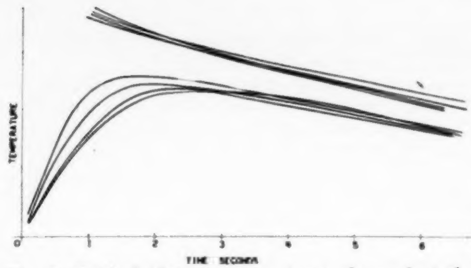

Fig. 8—Typical plot of temperatures observed at the various thermocouple stations during a casting run. The upper set of curves are those of couples in the casting, and lower set are those of couples in the mold.

CASTING NUMBER	4	R-2	R-3	R-4	5
TIME CONSIDERED MINUTES	3 TO 6	2TO 5	2 TO 5	3 TO 6	2 TO 5
TEMP OF CASTING START OF PERIOD	1395	1250	1370	1245	1425
TEMP OF CASTING END OF PERIOD	1275	1180	1260	1175	1325
TEMP OF MOLD START OF PERIOD	1135	1050	1160	1040	1230
TEMP OF MOLD END OF PERIOD	1070	1010	1085	1005	1170
ΔT CASTING	120	70	110	70	100
ΔT MOLD	65	40	75	35	60
ΔT CASTING TO MOLD START	260	200	210	205	195
ΔT CASTING TO MOLD END	205	170	175	170	155
AVERAGE ΔT CASTING TO MOLD	233	185	193	188	175
ΔT MOLD TO AIR START OF PERIOD	1065	980	1090	970	1160
ΔT MOLD TO AIR END OF PERIOD	1000	940	1015	935	1100
AVERAGE ΔT MOLD TO AIR	1033	960	1053	953	1130
q CASTING	29018	16927	26600	16927	24182
(AREA) X (ΔT) CASTING TO MOLD	517	411	428	417	388
U CASTING TO MOLD	56	41	62	41	62
q MOLD	27300	16800	31500	14700	
q CASTING + q MOLD	56318	33727	58100	31627	49382
(AREA) X (ΔT) MOLD TO AIR	3191	2966	3253	2944	3491
U MOLD TO AIR	18	11	18	11	14

Fig. 9—Computation of heat transfer coefficients for five castings. No mold wash was used except for a light wash with casting No. 5. Constants used are: Casting wt., 113 lb; mold wt., 120 lb; C_p copper, 0.1070 BTU/lb, deg F; C_p steel, 0.175 BTU/lb, deg F; area mold casting face, 2.22 sq ft; area mold air surface, 3.09 sq ft.

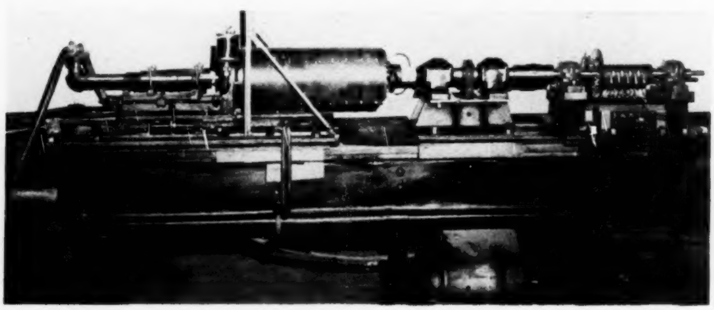

Fig. 7—The specially designed commutator is installed at the right of the centrifugal casting machine, and the internal burner used as a preheater for the mold is shown on the left.

for the rotating steel mold compares favorably with this value.

It should be pointed out that these results are a by-product of other research and are intended only to indicate the approximate values to be expected for those heat-transfer coefficients. The method described herein is capable of yielding more precise results, however, and it is hoped that these will be forthcoming.

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2. H. Y. Hunsiker, "Solidification Rates of Aluminum in Dry Sand Molds," Transactions, American Foundrymen's Society, vol. 55, p. 68 (1947).
3. W. H. McAdams, *Heat Transmission*, McGraw-Hill Book Co., 1942.
4. A. Bailey and N. C. Lyell, *Engineering*, vol. 147, p. 60, 1939.
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Schedule Third A.F.S. Gating Research Film Premiere for 1952 Convention

A. F. S. Aluminum & Magnesium Division's Research Committee will premiere its third sound, color film, "*Principles of Gating*," at the Division's May 3 technical session during the 1952 International Foundry Congress & Show in Atlantic City, it was announced at a meeting of the committee held at the Congress Hotel Chicago, September 14.

During the committee meeting, J. H. Jackson and K. Grube of Battelle Memorial Institute, Columbus, Ohio, where the film is being made, showed several scenes from the forthcoming picture. Most of the experimental work is completed, they said, and all that remains to be done is to edit the film.

It was also announced at the meeting that Battelle Memorial Institute has been granted $6,500 by the Society to carry out its Aluminum & Magnesium Division Research Project for another year, commencing October 1.

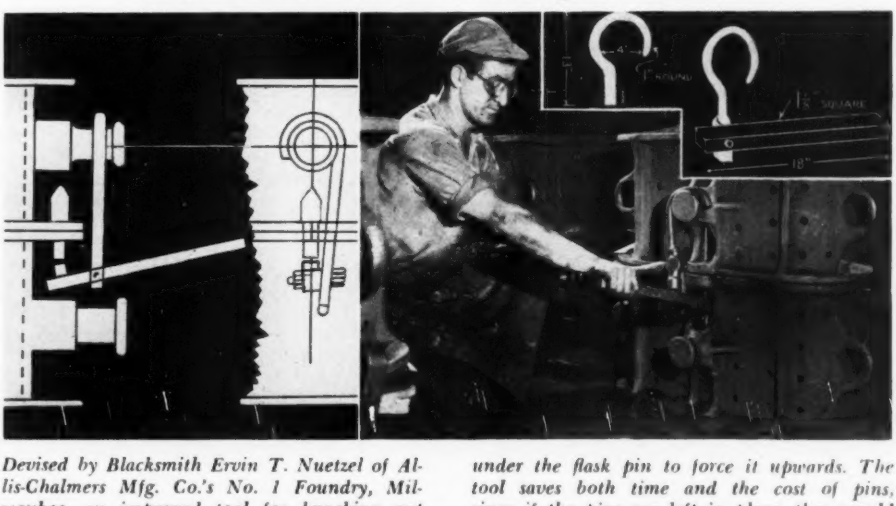
Malleable Iron Casting Industry Advisory Committee to NPA Named

Named as members of its Malleable Iron Industry Advisory Committee in a recent dispatch from the National Production Authority are:

Robert J. LaMarche, American Malleable Castings Co., Marion, Ohio; James H. Smith, Central Foundry Div., General Motors Corp., Saginaw, Mich.; L. J. Wise, Chicago Malleable Castings Co., Chicago; Anthony Haswell, Dayton Malleable Iron Co., Dayton, Ohio; G. J. Behrendt, Naugatuck Malleable Iron Works, Naugatuck, Conn.

P. H. Vincent, Erie Malleable Iron Co., Erie, Pa; W. A. DeRidder, General Metals Corp., Los Angeles; Frank D. Brisse, Laconia Malleable Iron Co., Laconia, N. H.; C. A. Gutenkunst, Jr., Milwaukee Malleable & Grey Iron Works, Milwaukee; W. H. Moriarty, National Malleable & Steel Castings Co., Cleveland; G. T. Boli, Northern Malleable Iron Co., St. Paul; Martin J. Lefler, Oliver Corp., South Bend, Ind.; R. L. Gilmore, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., and Cal C. Chambers, Texas Foundries, Inc., Lufkin, Texas.

How to Make a Tool for Knocking Out Flask Pins



Devised by Blacksmith Ervin T. Nuetzel of Allis-Chalmers Mfg. Co.'s No. 1 Foundry, Milwaukee, an improved tool for knocking out flask pins is easily made in the shop. The device consists of a hook which is placed over the top trunnion, and a bar which is placed under the flask pin to force it upwards. The tool saves both time and the cost of pins, since if the pins are left in place, they would be bent by uneven expansion of cope and drag. Also, if the pin were driven out with a hammer, the end might mushroom over.

A.F.S. National President Walter L. Seelbach invites foundrymen of the free world to attend the 1952 International Foundry Congress next May in Atlantic City, when A.F.S. will be international host.

Free World Foundrymen Meet at Brussels for 1951's INTERNATIONAL FOUNDRY CONGRESS

REPRESENTING 17 NATIONS, more than 500 foundrymen met September 10 to 14 in Brussels' magnificent Fabrimetal building to carry out a common purpose —free interchange between nations of knowledge that will ultimately improve the metal castings industry, its technology and its product.

Top delegates from the world's principal foundry technical associations participated in four days of technical sessions, plant visitations and social events. Representing the American Foundrymen's Society as official delegates to the 1951 International were Walter L. Seelbach, first A.F.S. President to attend a European International Foundry Congress since 1929, and Vincent Delport.

The Congress opened with an address of welcome by President J. Borgerhoff of the Belgian Foundry Technical Association. Responding for the international delegates was Dr. F. W. E. Spies of the Netherlands, president of the International Committee of Foundry Technical Associations. The Congress was then formally declared opened by Belgian Minister of Economy Coppé.

Several American Papers Presented

Opening technical sessions, with three in progress simultaneously, featured presentation of the official exchange papers of the American Foundrymen's Society, the Swedish Foundrymen's Society, and the Italian Foundrymen's Association. The Swedish paper, presented by Erik O. Lissell, dealt with mold and core oven design, and the Italian paper compared properties of sand cast and machine cast pig iron. The A.F.S. Exchange Paper, *"Risering Castings,"* by J. B. Caine, foundry consultant, Wyoming, Ohio, was presented in Mr. Caine's absence by W. S. Pellini, Naval Research Laboratory, Washington, D. C.

Several other papers by American foundrymen were included in Monday's program: *"Important Attributes of Malleable Iron,"* by James H. Lansing, Malleable Founders' Society, Cleveland; *"Continuous Melting for Malleable Foundries,"* by W. R. Jaeschke, Whiting Corp., Harvey, Ill.; *"Statistical Control in the Foundry,"* by H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland; and *"A Novel Method of Solidification Studies,"* by Victor A. Paschkis, Columbia University.

American Foundryman is indebted to Messrs. Jacques Foulon, Secretary General of the 1951 International Foundry Congress and Secretary of the Belgian Foundry Technical Association, and J. E. Rehder of the Bureau of Mines and Technical Surveys, Ottawa, Ont., Canada, for coverage of the International Congress.

Tuesday's technical sessions included papers on foundry controls, non-destructive testing, classification of casting defects, nodular iron and mechanization of foundries. Morning session's featured papers were *"A Classification of Foundry Defects,"* by G. Henon, Official Exchange Paper of the French Foundry Technical Association; *"Surface Treating Gray Iron to Meet Specific Industrial Applications,"* by C. O. Burgess, Gray Iron Founders' Society, Cleveland; and *"The Effect of Burn-Out on Melting Conditions with Special Reference to the Water-Cooled Cupola,"* by J. L. Jones and F. van Bergen of International Meehanite Co., Ltd., and Metaalgieterij de Globe, The Netherlands.

Among papers presented at the Tuesday afternoon sessions were *"Quantity Production of Spheroidal Cast Iron,"* by N. Croft, Lloyds, Ltd., Burton-on-Trent, England, Official British Exchange Paper; *"Considerations in the Mechanization of Foundries,"* by W. A. Morley, Link-Belt Co., Philadelphia; and *"Modern Unmechanized Foundry Operation,"* by Lester B. Knight, Lester B. Knight & Associates, Chicago.

At the dinner dance held that evening in the Hotel Atlanta, A.F.S. President and Mrs. Seelbach were welcomed and introduced by Dr. F. W. E. Spies, president of the International Committee of Foundry Technical Associations.

The entire group departed Wednesday morning, September 12, by chartered automobiles for a tour of steelworks and rolling mills in the Liege area.

Final technical sessions of the 1951 Congress, on Thursday, September 13, included three papers by North American foundrymen: *"Annealing and Heat*

Treatment of Nodular Iron," by J. E. Rehder, Department of Mines and Technical Surveys, Ottawa, Ont., Canada; *"Ductile Iron—Its Significance to the Foundry Industry,"* by A. P. Gagnebin, International Nickel Co., New York; and *"Formation and Growth of Nodules in Magnesium-Treated Hypoeutectic Irons,"* by W. S. Pellini and R. P. Dunphy, Naval Research Laboratory, Washington, D. C.

Two Official Exchange Papers were featured in the concluding technical sessions of the Congress, that of the Free German Foundry Society, *"The Formation of Graphite Nodules in Iron,"* by Dr. A. Wittmoser of Eisenwerke Gelsenkirchen, Gelsenkirchen, Germany, and the Belgian Foundry Technical Association's *"As-Cast Structure of Ca-Mg Treated Nodular Iron With and without Secondary Inoculation,"* by Albert L. DeSy, R. Collette and A. Vidts of the Foundry Research Station, University of Ghent, Belgium.

At the climaxing banquet Thursday evening, Congress President Borgerhoff, head of the host Belgian Foundry Technical Association, thanked the international delegates for contributing to the success of the Congress. In reply, Dr. F. W. E. Spies thanked the Belgian hosts on behalf of the participating nations.

Highlight of the Congress banquet was the first presentation of the International Foundry Award, to Rene Deprez, past president of the International Committee of Foundry Technical Associations and of the Belgian Foundry Technical Association. This award, conceived by Mario Olivo, president of the Italian Foundrymen's Association, consists of an exact copy of Benvenuto Cellini's famous "Perseus," which is retained for one year by the country in which the Congress is held, and a smaller replica to be retained permanently by its recipient.

Concluding the banquet, A.F.S. President Seelbach invited foundrymen of the free world to attend the 1952 International Foundry Congress in Atlantic City May 1 through 7, when the American Foundrymen's Society will act as host.

Friday and the weekend were given over to optional plant visits to Belgian foundries. The concluding feature of the Congress, also optional, was a two-day trip through the historic Ardennes mountains.

In addition to President and Mrs. Seelbach, A.F.S. Delegate Vincent Delport and the speakers previously mentioned, Americans attending the 1951 International Foundry Congress included George W. Cannon of George W. Cannon Co., Muskegon, Mich.; A.F.S. Past National Director and Mrs. C. R. Culling, Carondelet Foundry Co., St. Louis, and Mr. and Mrs. E. C. Hoenicke, Eaton Mfg. Co., Vassar, Mich.

Posed on the steps of the Fabrimetal building in Brussels, scene of the 1951 International Foundry Congress, were these members of the International Committee of Foundry Technical Associations. Left to right, front row, are: A.F.S. President Walter L. Seelbach, Mario Olivo (Italy), Tom Makemson of Great Britain, Dr. Kuster (Germany), Dr. Guido Vanzetti (Italy), Committee President F. W. E. Spies, (The Netherlands), Vincent Faulkner (England) and Marcel J. Borgerhoff (Belgium), president of the International Foundry Congress. Second row, from left: Dr. Muller (Germany), John Sissener (Norway), Colin Gresty (England), Erik O. Lissell (Sweden), J. Drachmann (Sweden), Dr. Reitsema (The Netherlands), and J. Foulon (Belgium), Congress secretary. Top row, from left: A. Brizon (France), Vincent Delport (United States), M. Vuilleumier (Switzerland), J. Goffart (Belgium), Prof. Ove Hoff (Denmark) and Dr. Hugo (Germany). The Committee is made up of executive officers of member national associations.

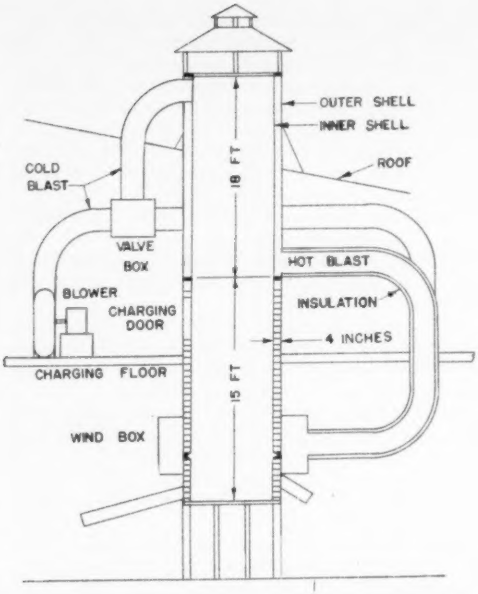


Fig. 1—Diagrammatic sketch of 1½-ton-per-hr cupola used to test heat exchanger at Texas A & M College foundry over a five-year experimental period.

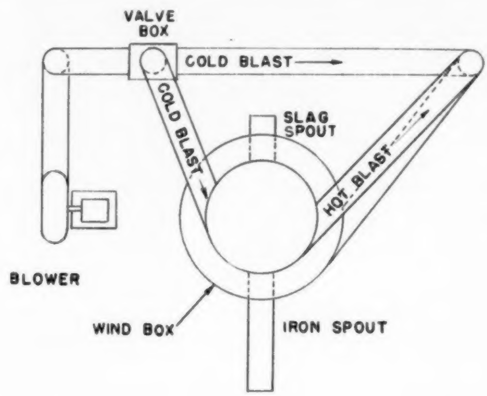


Fig. 2—Plan view of piping system employed on test cupola. Spacers direct flow of air and support the welded steel inner shell and control its contour.

AIR PREHEATER UNIT FOR SMALL CUPOLAS AIDS MELT EFFICIENCY

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Associate Professor
Department of Mechanical Engineering
Texas A & M College
College Station, Texas

Relatively few changes have been made in the cupola from its inception to the present. The average foundryman accepts his coke bill with little or no question, paying no heed to the vast amount of energy that escapes from the cupola stack. It is known that the world's natural resources are dwindling and that something must be done to conserve them. Yet the basic industrial device for melting iron, the cupola, has essentially the same inherent thermal inefficiencies and design today as did the first cupola erected in the United States in 1820. Here, the author describes an economical heat exchanger that has materially increased cupola melting efficiency during a five-year testing period at Texas A&M College.

Many small cupolas operate only intermittently and of necessity are limited to small annual production. One of the greatest problems in the operation of these cupolas is loss of heat energy through the stack and the resultant high ratio of fuel consumption per ton of metal melted.

With this in mind, the Mechanical Engineering department of Texas A & M College launched an investigation in 1946 to determine whether an economical heat exchanger could be devised for small cupolas. Material for the heat exchanger, whose design is shown in Figs. 1 and 2, was supplied and fabricated by Lufkin Foundry & Machine Co., Lufkin, Tex. Installation was made in the school's standard commercial cupola, rated at 1½ tons per hr.

Located in the school foundry, this cupola is used primarily for classroom instruction and as such is limited to small, infrequent heats. In fact, heats during the five-year test period have been so small that it is doubtful if equilibrium of operation was reached during any one heat. However, definite trends were revealed and certain conclusions regarding increased melting and combustion efficiency through use of the heat exchanger may be drawn.

Figure 1 shows the details of the heat exchanger. The valve, in one position, directs the air to the top of the stack into the preheating chamber and thence to the wind box; while in a second position, it permits the air to bypass the preheating chamber and go directly to the windbox. This permits comparison of the performance of the two systems when applied to the same cupola.

Figure 2 is a plan view of the piping system. The air blast enters tangentially at the top of the stack into the preheating chamber and is thought to circulate with a spiral downward motion in the annular space to the exhaust duct located approximately 2 ft above the top of the charging door. There are no internal baffles to direct the flow of air, other than spacers, which are used primarily to support the inner shell and control its contour. Essentially, the only change from the conventional cupola is the replacement of

the expensive brick lining above the charging door with a welded steel inner shell.

A few calculations on the effluent gases of a standard 72-in. cupola, operating with a cold blast and under normal conditions, will serve to demonstrate the tremendous amount of heat energy going out the stack per ton of iron melted. A cupola of this size will burn, on the average, about 2 tons of carbon and yield approximately 22 tons of melted iron each hour. If it is assumed that the combustion efficiency in the cupola is 100 per cent, which is far from being the case, the volume of effluent gas per hour leaving the stack would be 570,000 cu ft.

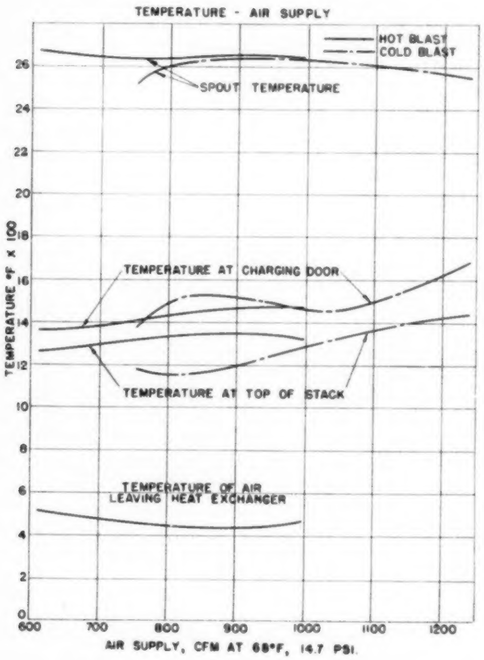


Fig. 3—Relation between temperatures and air supply (standard conditions) in experimental hot blast cupola.

If the stack gas temperature is assumed to be 1200 F just above the charging door, the sensible heat in the gas for nitrogen would be 10,000,000 Btu per hr, and for carbon dioxide, 4,000,000 Btu per hr. The total sensible heat leaving the stack unused would be, in round figures, 14,000,000 Btu per hr.

When transformed into horsepower or kilowatts, or equivalent tons of coke, this figure is significant—

Equivalent horsepower: $14{,}000{,}000 \div 2545 = 5500$

Equivalent kilowatts: $14{,}000{,}000 \div 3410 = 4100$

Equivalent tons of carbon per hr: $14{,}000{,}000 \div 14{,}550 \times 2000 = 0.48$

Thus almost half a ton of coke is wasted.

The above figures represent equivalent energy and equivalent power. To transform this energy into mechanical energy is another problem. Furthermore, it is a rare instance wherein a cupola will operate with perfect combustion, which means that there is more energy in the form of potential heat that leaves through the stack because of the incomplete combustion of carbon monoxide, or a loss of energy if excess air is supplied. Because of the incomplete combustion, the effluent gas temperature is somewhat lowered.

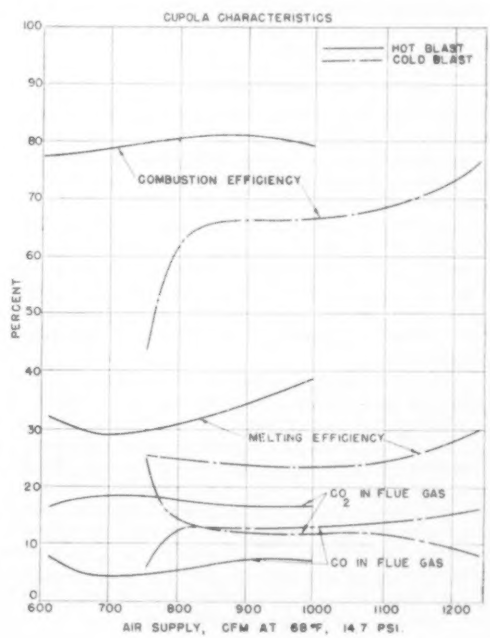
It might be reasoned that energy loss would be reduced because of lower stack temperatures. However, energy loss because of potential heat in carbon monoxide far outweighs that gained because of reduced stack temperatures. Each pound of carbon monoxide that burns to carbon dioxide will liberate approximately 10,000 Btu's.

Cupola Utilizes Waste Heat

The modern blast furnace utilizes latent heat in exhaust gases for preheating its air blast. Modern power plants have devised various types of heat exchangers, trying to salvage as much energy from flue gases as is economically feasible. The open-hearth furnace utilizes its exhaust gases for preheating air blast. In fact, it is difficult to mention an apparatus where chemical and thermodynamic reactions are relied upon for production, in which some type of heat exchanger is not incorporated.

One outstanding exception to the heat exchanger is the modern cupola. There are a few commercial cupola designs that extract energy from the cupola at the expense of charges in the cupola proper and

Fig. 4—Improved combustion and melting efficiencies and flue gas analysis show advantages of heated blast.



*Details of mathematics can be found in Chapter 22, Thermochemical Principles, A.F.S. HANDBOOK OF CUPOLA OPERATION.

several that depend upon an external source of heat to preheat the air blast and, in so doing, bring about an additional thermodynamic loss of energy.

Each system has as its primary aim preheating the air. Again, a few simple calculations applied to the 72-in. cupola mentioned previously will show the amount of energy saved if air entering the cupola can be preheated by flue gas to 632 F. The amount of air, assuming complete combustion and supplied as shown, is 570,000 cu ft per hr. If the specific heat of air is approximately 0.0185 Btu per cu ft per deg F, then the heat absorbed should be, in round figures, (570,000) (0.0185) (632-32) = 6,000,000 Btu per hr, or approximately 45 per cent of the energy leaving the stack.

The tests at Texas A & M were aimed at taking advantage of this waste heat.

Close Watch Kept on Variables

In the five-year series of heats, an effort was made to keep possible variables under control at all times. The bed was thoroughly ignited and was brought to the same level in the cupola before successive charges of iron, coke, and limestone were introduced. The blower supplying the air blast had a fixed opening during any one heat; thus, the quantity of air delivered was essentially constant. Insofar as possible, the ferrous charge was maintained at 50 per cent scrap iron and 50 per cent pig iron. The charges were added after the coke bed was properly burned through and preheated, and the blast was not turned on until carbon monoxide flames began to burn at the charging door. This procedure, is was thought, would minimize possible unknown variables.

One variable which could not be controlled with the equipment on hand, was the moisture content and temperature of air taken into the blower. The influence of these variables was, however, considered in calculations of the tests.

Air Supply Predetermined

Realizing that there would be a variation in conditions of the air blast as well as resistance to the passage of air in the combustion chamber of the cupola, an extra precaution was taken to meter the air supplied to the wind box. A calibrated pitot tube and test section was installed in the middle of the straight portion of the insulated duct which leads into the wind box. Temperature of the air was automatically recorded as it passed through the test section. The moisture content of the air entering the blower was determined by means of an electrical fan-driven hygrometer.

Data thus obtained permitted determination of the quantity of air supplied to the wind box, reduced to standard conditions for hot blast and cold blast. Quantity of air supplied was controlled by the degree of opening on the blower. The opening was fixed during two successive heats, that is, the same blower conditions on the intake side prevailed for the hot blast as during the cold blast. Thus, the only controllable variable that was varied during the series of heats was the opening and, in turn, the quantity of air supplied to the wind box. The iron-coke ratio was maintained at 11.5 to 1 throughout the test.

Performance of the cupola, when operating with the hot blast, is considerably improved over performance when operating with cold blast. This is borne out in Figs. 3 and 4. It may be seen that tap-out temperature of the iron is somewhat greater, combustion efficiency is greater, and more important, melting efficiency is considerably improved. With the improved melting efficiency, correspondingly more iron is melted per unit time in a particular cupola.

Higher melting efficiency results because preheated air supplied for combustion contains a considerable amount of heat energy before entering the cupola. Secondly, combustion efficiency is improved, increasing melting efficiency. Flue gas analysis reveals less carbon monoxide when employing preheated air. This would indicate that better and more thorough combustion occurs in the combustion zone of the cupola.

Conclusions

1. There is approximately 20 per cent difference in the quantity of air delivered to the wind box when using the hot blast system, as compared to cold blast for the same blower opening. This is caused by greater friction resulting from greater distances for the air to travel, and higher velocity throughout the system because of volumetric expansion of air, induced by its being heated. Also, some air was lost through leakage.
2. The blower employed is a centrifugal type and the net quantity of air delivered is greatly affected by back pressure on the blower. Because of blower size and back pressures developed, no tests were run on either the hot blast or cold blast systems involving an adequate supply of air for complete combustion.
3. The trend of melting efficiency curves indicates that even greater benefits would have resulted if the blower had been able to deliver more preheated air.
4. The tested type of heat exchanger has proved to be inexpensive and efficient. The original inner steel shell is still in operation and has been exposed to many heats during the past five years. Cost of the steel inner shell is cheaper than brick.
5. Flue gas at the top of the stack has a high temperature, indicating that the 18-ft heat exchanger section could be lengthened economically, reducing the stack temperature proportionately. This would result in a corresponding raise in the temperature of preheated air leaving the heat exchanger section.

Use Rays from $7,000-Per-Oz Metal For Light Alloy Castings Inspection

THULIUM, a rare earth metal irradiated in an atomic furnace, has been used successfully in determining defects in light alloy castings, it was announced by Dr. R. West of Britain's Atomic Energy Research Establishment at a recent international meeting of scientists at Oxford University.

When irradiated in the Establishment's atomic pile, thulium becomes radioactive and gives off softly penetrating gamma rays which are of the correct intensity for making a detailed radiographic picture of a half-inch aluminum alloy casting, Dr. West reported. Radiography of aluminum alloy castings has to date been extremely difficult because rays from most radioactive elements were found to be too penetrating.

DETERMINATION OF TIN, SILVER, IRON, BISMUTH AND COPPER IN LEAD

W. L. Miller
Mario Acampora
George Norwitz*
Material Lab., New York Naval Shipyard
Brooklyn, N. Y.

A RAPID AND CONVENIENT sequence method is described for determining tin, silver, iron, bismuth, and copper in a single sample of lead. The method is sufficiently accurate for the analysis of refined lead (99.7+ per cent) and eliminates several time-consuming operations. Copper is determined colorimetrically with rubeanic acid in a procedure novel in its application to lead analysis. The other elements are determined by familiar procedures suitably modified to fit the sequence method.

Apparatus and Special Reagents

A photoelectric colorimeter, such as the Klett-Summerson, with a test tube cell and 420, 470, and 660 millimicron filters.

Thiourea Solution (5 per cent): Dissolve 5 grams of thiourea in distilled water, dilute to 100 ml and filter. Prepare fresh solutions as needed.

Sodium Thiocyanate Solution (4 per cent): Dissolve 100 grams of sodium thiocyanate in distilled water and dilute to 2.5 liters.

Acetate Buffer Solution: Dissolve 500 grams of ammonium acetate in a mixture of 200 ml of glacial acetic and 400 ml of distilled water. Dilute to 1 liter with water.

Gum Arabic Solution: Add 10 grams of gum arabic to 500 ml of hot distilled water slowly with stirring until dissolved. Allow to simmer on a hot plate for 1 hour. Keep well stoppered and refrigerated.

Rubeanic Acid Solution: Dissolve 0.5 gram of rubeanic acid (dithio-oxamide) in 500 ml of 95 per cent ethyl alcohol. The solution is stable for 2 to 3 months.

Method

Tin: Dissolve a 10-gram sample in a 300-ml beaker with 40 ml of conc. nitric acid and 160 ml of distilled water. After solution is complete, boil for 15 min to precipitate metastannic acid. Filter through a close paper containing a small amount of paper pulp and wash with hot dilute nitric acid (1 per cent). Transfer the paper with precipitate to a 500-ml Erlenmeyer flask and add 15 ml of conc. sulphuric acid, 5 ml of perchloric acid (70 per cent), and 15 ml of conc. nitric acid. Evaporate to strong fumes of sulphuric acid. Cool, add 200 ml of distilled water and 75 ml of conc. hydrochloric acid. Complete the determination volumetrically as in the ASTM procedure.[1]

Silver: Add sufficient dilute hydrochloric acid (1:100) to precipitate silver from the above tin filtrate. Avoid a large excess. Heat to coagulate the precipitate. Cool, and filter through a Gooch crucible. Wash well with dilute nitric acid (1:100) and once with water. Dry and weigh the AgCl precipitate.

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NOTE: The opinions expressed in this paper are those of the authors and are not to be construed as representing the official views of the Navy Department.

Iron: Dilute or evaporate the solution from the silver precipitation as necessary to adjust to exactly 250 ml. Transfer a 25-ml aliquot to a 100-ml volumetric flask. Add 1 ml of hydrogen peroxide (3 per cent) and dilute to the mark with sodium thiocyanate solution (1 per cent). Measure a portion colorimetrically within 5 min at 470 millimicrons wave length. Determine the iron percentage by reference to a graph or chart prepared from synthetic samples containing 0.001 per cent to 0.020 per cent iron.

Bismuth: Transfer a 25-ml aliquot of the above master solution to a 100-ml volumetric flask. Add 40 ml of water and 25 ml of thiourea solution. Dilute to the mark with water. Measure the yellow color within 1 hr at 420 millimicrons. A percentage chart or graph is prepared from synthetic samples containing 0.01 per cent to 0.35 per cent bismuth.

Copper: Transfer a 10-ml aliquot of the master solution to a 100-ml volumetric flask. Add 5 ml of acetate buffer solution and 2 ml of gum arabic solution. Dilute to 100 ml with water and mix by shaking. Add 1 ml of rubeanic acid solution and mix. Measure the green color within 15 min at 660 millimicrons. A percentage chart or graph is prepared from test lead with added copper of 0.001 per cent to 0.10 per cent. Copper above 0.10 per cent requires smaller aliquots. In view of frequent contamination from traces of copper, it is advisable to carry a blank sample of test lead through the method. This sample is then used for the colorimetric zero setting.

TABLE 1 - COPPER AND BISMUTH DETERMINATIONS IN LEAD

Copper Present, %	Copper Found, %	Bismuth Present, %	Bismuth Found, %
0.020 (a)	0.023	0.05	0.05
0.020 (b)	0.023	0.05	0.05
0.020 (c)	0.023	0.10	0.10
0.050 (a)	0.052	0.10	0.10
0.050 (b)	0.050	0.25	0.26
0.050 (c)	0.047	0.25	0.25
0.100 (a)	0.093		
0.100 (b)	0.098		
0.100 (c)	0.100		

(a) Contains 0.00% bismuth. (b) Contains 0.10% bismuth. (c) Contains 0.25% bismuth.

Discussion

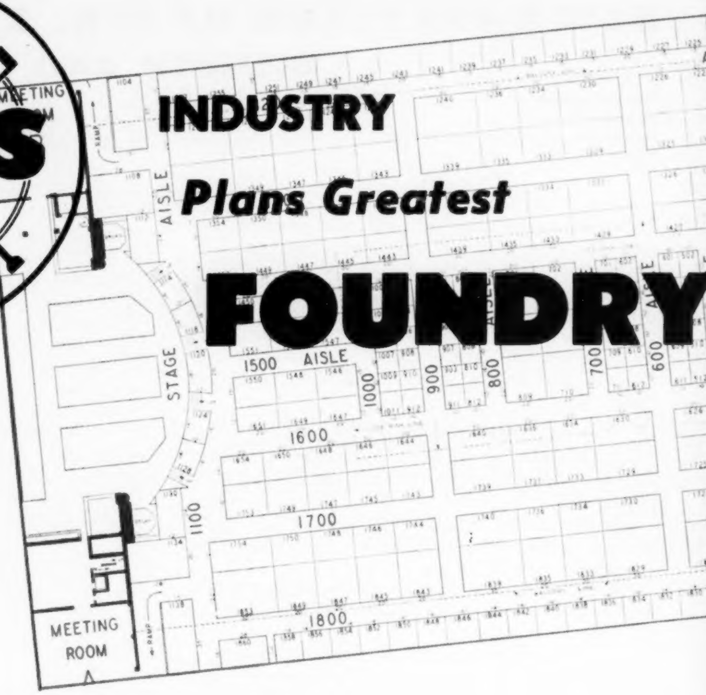
While the method described is best suited for analyzing refined lead, it may well be adapted, with suitable precautions, to lead of low purity or with appreciable amounts of alloying elements. For example, silver in silver-lead solder would cause no interference. Large amounts of tin would require treatment of the tin precipitate to recover traces of other elements. Antimony in refined lead does not interfere, but amounts present in antimonial lead cause interference with the bismuth determination.

In the procedure for silver, the concentration of nitric acid is sufficient to prevent precipitation of bismuth oxychloride. The authors found that the presence of an appreciable amount of nitric acid did not interfere with the colorimetric bismuth determination.

The colorimetric determination of copper with ru-

(Continued on Page 93)

INDUSTRY Plans Greatest FOUNDRY



"Every Foundry in '52"

WORLD'S GREATEST CONCENTRATION of new tools for the foundry industry, displayed in the huge Atlantic City Auditorium, will be a top attraction expected to draw foundrymen from all parts of the free world to the 1952 A.F.S. International Foundry Congress & Show, next May 1 through 7.

During the week-long Foundry Show, to be held in conjunction with the 1952 International, latest developments in foundry equipment, supplies and services will be housed on one floor of Atlantic City's Auditorium, largest in the world. This great showcase of the foundry equipment and supply industry, coupled with the top technical programs that make up the 1952 International Foundry Congress, is expected to attract representatives from "Every Foundry in '52."

Foundry Show Brochure Mailed

A comprehensive brochure on the 1952 Foundry Show, including a floor plan of the Atlantic City Auditorium and general information, was mailed to all prospective exhibitors October 24. Applications for space submitted on or before December 1 will be considered as of that date and assignments will be made in accordance with A.F.S. Foundry Show policies established by the Exhibits Committee.

Keyed to great conventions such as the 1952 International, Atlantic City offers the finest of facilities to the world's foundrymen—luxury hotels with thousands of comfortable rooms and suites and excellent luncheon and dinner accommodations—plus the city's own natural attractions that have made it renowned as a recreational center.

For the first time in the history of A.F.S. and the foundry industry, the program of the 1952 International Foundry Congress & Show will last an entire week. Scheduled are six days of technical sessions, plant visitations, Ladies Entertainment and social and recreational events, when busy foundrymen will have an opportunity to relax, renew old acquaintances and make new ones.

Sessions Scheduled by Interest

Foundry exhibits will remain open throughout the entire Congress, while technical sessions and related events will be closely scheduled by Divisional interest so as to give the visiting foundryman the maximum opportunity to assimilate technical information of particular interest to his segment of the castings industry within a minimum of time.

Thus, non-ferrous sessions, shop courses, round table luncheons and other non-ferrous events are all scheduled for the first three days of the Congress, while ferrous sessions and activities are largely confined to the last three days. General interest sessions are also scheduled primarily the last three days.

Plant visitations by chartered buses to nearby foundry centers will be program features on Friday, May 2, and on Tuesday, May 6. A comprehensive program of events for the entertainment of ladies of the 1952 International Foundry Congress is planned to include

SHOW Atlantic City 1952

"Every Foundry in '52"

sightseeing tours of the historic Atlantic City area, luncheons, teas and other functions.

Highlight events of the '52 International will include a colorful opening day ceremony, the A.F.S. Chapter Officers and Directors Dinner, the Annual A.F.S. Business Meeting, followed by the Charles Edgar Hoyt Annual Lecture, the A.F.S. Annual Banquet, which this year for the first time will feature professional entertainment instead of a speaker, the International Reception, and the International Educational Dinner.

Two Defense Luncheons Scheduled

Two luncheon meetings which proved extremely popular last year, the Defense Production Luncheon Meeting and the Equipment & Supplies Luncheon, will again be held. The Defense Production Luncheon, which affords foundrymen an opportunity to discuss their problems with top National Production Authority officials, will be divided into two luncheons, one for non-ferrous foundrymen on May 1, and one for ferrous foundrymen May 5.

In addition to the six days of regular technical sessions, Non-Ferrous, Gray Iron, and both Ferrous and Non-Ferrous Sand Shop Courses are scheduled, as are Aluminum & Magnesium, Brass & Bronze, Patternmaking, Malleable, Gray Iron and Steel Round Table Luncheons. International Committees and A.F.S. Divisional and General Interest Committees will meet throughout the Congress, particularly on Sunday, May 4, when no technical meetings are scheduled.

Exhibits of foundry equipment, supplies and services in the concurrent Foundry Show will be open at slightly varying hours throughout the Congress so as to provide maximum opportunity for their inspection.

On opening day, Thursday, May 1, "Defense Day," exhibits will open at 9:30 a.m. and close at 5:30 p.m. On Friday, May 2, "Chapter Day," they will open at 9:00 a.m. and close at 9:30 p.m. On Saturday, May 3, "President's Day," exhibits will not open until noon, to avoid conflict with the A.F.S. Annual Business Meeting and the Hoyt Lecture. They will close at 5:30 p.m.

Sunday, May 4, "International Day," exhibits will be open free of charge from 10:00 a.m. to 6:30 p.m. to employees of plants in the Chesapeake, Philadelphia and Metropolitan Chapter areas. They will reopen at 9:00 a.m., Monday, May 5, "Management Day," closing at 5:30 p.m. The same opening and closing hours will apply on Tuesday, May 6, "Old Timers Day." On the final day of the Congress, Wednesday, May 7, "Exhibitors' Day," the exhibits will open at 9:00 a.m., closing at 4:00 p.m., when the Congress ends.

Thus every conceivable phase of the 1952 International has been carefully planned and programmed to give representatives of "Every Foundry in '52" the utmost in technology and the opportunity to inspect the latest in foundry equipment, supplies and services offered by the world's leading manufacturers of tools for the castings industry—a combination that will make the 1952 International Foundry Congress & Show a milestone in the castings industry.

CALCULATING RISER DIMENSIONS

a basic approach to risering gears

R. A. Willey, Chief Metallurgist
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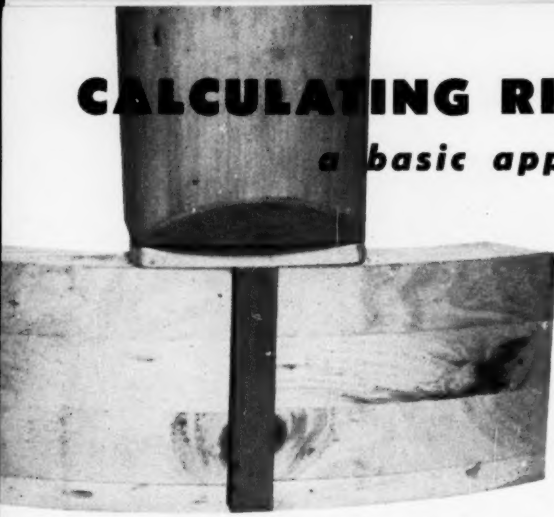


Fig. 1—Section of gear pattern with 1 in. thick section from which riser dimensions were determined.

A method of computing riser dimensions has been worked out by the author on the basis that the freezing rate of a casting or section of casting can be estimated by a comparison of the surface areas dissipating heat and the respective volume, or the ratio of section surface area to section volume. Freezing rates for risers of various sizes have been tabulated on the same basis, and a comparison of casting section and riser freezing rates indicate riser size required for proper feeding. Riser weights and dimensions are included.

For many years the foundryman's decision concerning the size of risers for a casting has been a not too satisfactory art, and from time to time he has searched for a more scientific approach to the problem.

During the past few years various empirical methods of risering have been devised, and in 1948 a scientific method for calculating riser dimensions was proposed by J. B. Caine.[1] Our chief objection to the proposed method is that the calculation of a riser is a matter of trial and error, and there is no guide to the selection of the most efficient riser.

The writer sees the problem of shrinkage in a casting as composed of two phases, namely, shrinkage at the riser-casting interface, and shrinkage within the casting and separated from under-riser shrinkage. It is this first phase that the writer is primarily interested in discussing. It is well known that the basic requirement for a sound casting is the establishment of favorable temperature gradients to insure directional solidification and, if such gradients are present, the riser can promote feeding for unlimited distances. The riser dimensions can do little toward establishing the favorable temperature gradients within the casting except at or near the riser-casting contact. Assuredly, the temperature gradient necessary cannot exist unless the riser or risers are the last to solidify.

It is fundamental that if a riser is to function properly it must remain liquid until the casting or section to be fed has completely solidified. It is generally agreed that the problem of solidification shrinkage is divided into the two phases previously mentioned, and must be considered, studied and controlled as a separate entity.

One part, which is under discussion for a particular type of casting, is concerned with shrinkage at the casting-riser contact. A shrink occurs here because an improperly dimensioned riser had an inadequate volume of metal remaining liquid longer than the casting or section of casting.

Shrinkage defects relatively remote from the riser are an entirely different phase of the problem of risering castings. Control of this type of shrinkage is based on directional solidification and is not dependent on size or shape of the riser.

Many are of the opinion that under-riser shrinkage is dependent on two factors: (1) having sufficient metal in the riser to supply the feed demand of the casting or section of casting during solidification; and (2) that the volume is sufficient to remain liquid and available to casting during solidification up to the time of freezing of the junction of the riser and casting.

However, it is the writer's opinion that the latter factor need only be considered when calculating riser dimension. If the riser is of sufficient volume to freeze less rapidly than the casting or section of casting beneath the riser, then the riser will have sufficient volume of liquid metal available to meet the contractional demands of the casting during solidification.

The only volume consideration of the casting to be estimated is the volume directly beneath the riser. Recent published work of Bishop and Pellini[2] has shown that the horizontal distance a riser can feed from the perimeter of the riser to the edge of a casting of uniform section is not increased by increasing the riser size or volume. For example, they were able to feed a 24 in. circular plate 2 in. thick with a 6-in. or

7½-in. riser. The feeding distance was 8¼ in. When the diameter of the 2-in. plate was increased to 36 in. no under-riser shrinkage occurred. However, there was considerable shrinkage in the plate and it extended very close to the riser perimeter. In fact, the feeding range of the riser was not negligible.

It might be contended that in the case of the 36 in. circular plate the shrinkage extending to the riser perimeter was due to lack of volume in the riser to meet the increased feed demand of the casting. The writer is of the opinion that unfavorable heat gradients within the casting were the cause of extensive shrinkage in the casting, and that the shrinkage was not due to any volume consideration of the riser.

Thus far it has been emphasized that there are two types of shrinkage in a casting—(1) shrinkage within the casting, and (2) shrinkage at the riser contact—and that in this discussion we are only interested in the latter type. It has also been pointed out that to many foundrymen there are two independent factors that control shrinkage at the riser contact; (1) shrinkage will occur if there is not adequate volume to meet the feed demand during solidification; and (2) shrinkage will occur if the volume of liquid metal in the riser is not sufficient to remain liquid during solidification up to the time of freezing of the junction of the riser and casting.

It was also stated that in this discussion only the latter factor is considered because if the volume of the riser is of sufficient volume to freeze last, then it is axiomatic that there will be sufficient volume of metal to meet the feed demand resulting from contraction of the casting during solidification.

About two years ago the writer became particularly interested in devising a more satisfactory method for determining the riser dimensions for gear blanks—particularly double-flanged gear blanks—than the present empirical method of inscribed circles and applying a 15 per cent increase. By this method too many cases of shrinkage occurred at the riser-casting contact.

The method devised for determining the dimensions of risers for gear blanks involves several preliminary assumptions. We feel that these assumptions are somewhat valid as the application of this simple method has proved very satisfactory. In the first place, it is assumed that all risers should be cylindrical, having a height equal to the diameter; that the mold is all of the same composition; that the temperature of the casting beneath the riser and the riser are approximately the same; and that the temperature of the mold face beneath the riser is the same.

Fig. 2 (left and above)—Patterns for double-flanged gear blanks show the padding methods used to properly feed the castings. Riser sizes are calculated from a 1-in. section through the padding and gear face.

TABLE 1—RISER DIMENSIONS AND FREEZING RATES
(SA—surface area; V—volume)

RISER HEIGHT, IN.	RISER DIAM., IN.	$\frac{SA}{V}$ RATIO	RISER HEIGHT, IN.	RISER DIAM., IN.	$\frac{SA}{V}$ RATIO
4	4	1.20	15	15	0.33
5	5	1.00	16	16	0.31
6	6	0.83	17	17	0.29
7	7	0.70	18	18	0.27
8	8	0.62	19	19	0.26
9	9	0.55	20	20	0.25
10	10	0.50	21	21	0.24
11	11	0.45	22	22	0.227
12	12	0.41	23	23	0.217
13	13	0.38	24	24	0.208
14	14	0.35	25	25	0.200

This simple method of calculating riser dimensions is based on the conception that the rate of solidification of bodies of various shapes is proportional to the ratio of the surface areas dissipating heat to the respective volume. It is not meant that such a simple formula can be used to calculate the time of solidification, but that if the numerical ratio of two bodies are different then it can be assumed that their rates of solidification are different. In other words, the solidification rate or freezing rate of a casting or section of a casting can be estimated by comparing the surface areas dissipating heat and the respective volume of the casting or section of the casting. Thus the relative "freezing rate" ratio of a casting may be calculated:

$$FR = \frac{\text{Surface Areas Dissipating Heat}}{\text{Volume of Section}} = \frac{SA}{V}$$

Henceforth in this discussion the symbol SA refers to surface areas dissipating heat equally, FR to freezing rate, and V to the volume in question.

Since it is felt that this simple ratio expression is a measure of the rate at which a riser, casting or section of a casting will solidify, it can be used to determine riser dimensions. All that is necessary is to determine the surface area-volume ratio of the casting or section of casting, and then determine what riser has a similar numerical surface area and volume ratio.

If the surface area and volume ratio of the casting and riser are numerically the same, then both can be expected to solidify at approximately the same time. However, if it is desired to have the riser freeze more slowly than the casting, then a riser having a different surface area-volume ratio must be used. In other words, the riser diameter must be increased from ½ in. to 1 in. over the calculated dimensions.

The problem of calculating riser dimensions for gear blanks involves a method of determining the surface area-volume ratio of the section of the casting beneath the riser, and then determining what riser has a similar surface area-volume ratio and adding a safety factor of ½ in. to 1 in. to the diameter.

First, consider the surface area-volume ratio of a cylindrical riser in which the height is equal to the diameter. The relative rate a riser will solidify is

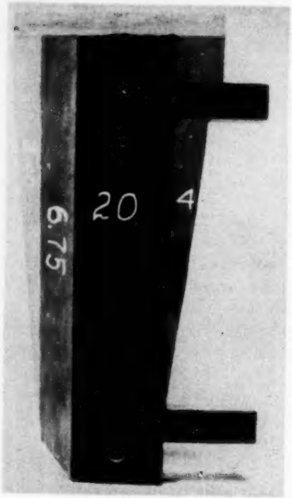


Fig. 3—The 1-in. section of the pattern for a double-flanged gear blank is shown with the tapered pad added to promote feeding, and which must be considered in calculating riser dimensions.

dependent on the ratio of the surface areas dissipating heat and the volume of the riser.

In most cases gear blanks are risered by placing open risers around the face of the gear, and all feeding is vertical. In determining the surface area-volume ratio of such risers, it is considered that no heat is dissipated at the junction of the casting and riser, and that equal amounts of heat are dissipated at the sand-riser interface as well as by the top of the riser.

The surface area-volume ratio of cylindrical risers neglecting an end effect and having a height equal to the diameter can be expressed by the equations:

$$FR = \frac{\pi r^2 + 4\pi r^2}{2\pi r^3} \quad (1)$$

$$FR = \frac{5}{2r} \text{ or } \frac{5}{d} \quad (2)$$

$$d = \frac{5}{FR} \quad (3)$$

If the freezing rate of a casting or section of a casting were known, the numerical value could be substituted for FR in equation (3) and solved for d. This will give the diameter of a 1-1 riser whose surface area-volume ratio is equal to the surface area-volume ratio of the casting in question. Therefore, in order to have the riser cool more slowly than the casting it will be necessary to increase the diameter of the riser ½ in. to 1 in. This is the "safety factor."

Since the surface area-volume ratio of a 1-1 riser is always the same, it is a simple matter to prepare a table showing the numerical value of risers in ½-in. or 1-in. increments. Such a table can be used in place of substituting in equation (3).

As previously mentioned, it is only necessary in risering gears to consider the volume of the casting directly beneath the risers. The only surfaces that dissipate heat in a gear casting are the inside and outside faces, and the drag of the face. Therefore, the surface area and volume ratio can be determined from a 1-in. section through the casting.

For example, consider the simplest type of gear—a ring gear of the following dimensions: outside diameter, 32½ in.; inside diameter, 30 in.; depth of face, 6 in.

In risering such a gear no padding would be added to the gear face to facilitate feeding. A 1-in. section below the riser would be a parallelepipedon 1x2½ x6 in. The volume of this 1-in. section would be 1x2½ x6 = 15 cu. in. The surface area would be 6 + 2.5 + 6 = 14.5 sq. in. Therefore, the FR of a 1-in. section of the casting directly beneath the riser is calculated:

$$FR = \frac{14.5}{15} = 0.966$$

Calculating for FR of 2- or 3-in. sections will give the same numerical result.

Table 1 shows that a riser having a freezing rate of 0.966 would be less than 6 in. and over 5 in. in diameter. A table similar to Table 1 but prepared in ½-in. increments would show the riser to be greater than 5 and less than 5½ in. Therefore, 5½- or 6-in. risers must be used to feed this ring gear.

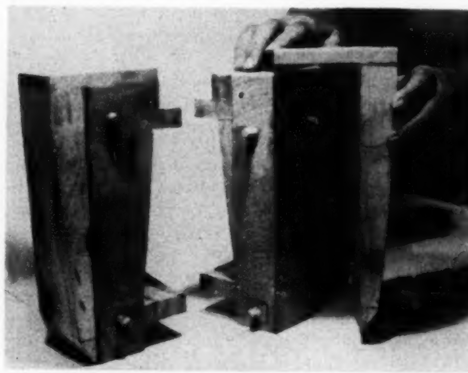


Fig. 4 (above and right)—The sectioned double-flanged gear pattern illustrates tapered pad and 1-in. thick section. Relative freezing rate of the 1-in. section is computed as 0.62 which, with safety factor added, is the freezing rate of an 8½-in. diameter riser.

The approximate diameter of the risers needed to feed this casting can be determined by substituting in equation (3) and solving for d:

$$d = \frac{5}{FR} \text{ or } d = \frac{5}{0.966} 5.1 \text{ in.}$$

By either method a 5½ or 6 in. diameter riser would be used. This method only indicates the size of the riser and not the location or number of risers.

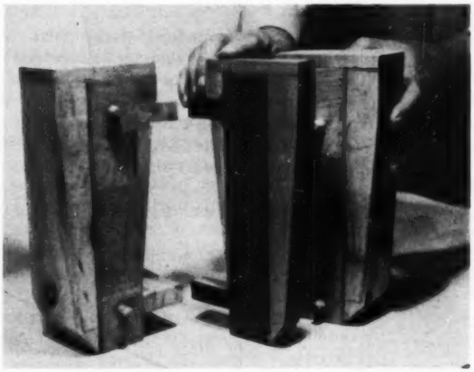
Figure 1 shows a section of the pattern of the gear with the 1 in. thick section used to calculate the riser dimensions, and the riser used after calculation.

In the case of double-flanged gear blanks it is not possible to determine the surface area-volume ratio from the blueprint dimensions as it is necessary to pad the face of the gear to properly feed the casting.

Before we started calculating the riser for this type of gear, the pads were governed by the size of the riser and there was little attempt to taper the pad. Now, the procedure is to carefully determine the necessary padding and then determine the proper riser size by determining the surface area-volume ratio of a 1-in. section through the padding and gear face. Contrasting padding methods are shown in Fig. 2.

The thickness of the flange indicates the thickness of the pad on the OD; then from the bottom of the lower flange taper is added to the cope side at the rate of 1 in. per foot. The corebox also is tapered from ½ to 1 in. between the two flanges.

The next determination is the freezing rate of a 1-in. section. In this case the 1-in. section is not a parallelepipedon due to the taper. The surface area can easily be determined as it is the perimeter. The volume is determined easily as the 1-in. section is divided into a series of triangles and rectangles.



To illustrate the method let us consider the following examples of a double flanged gear blank having the following face dimensions: flange thickness, ¾in.; face thickness, 2 in.; face depth, 10 in.

Figure 5 illustrates the pad, the 1 in. thick section, and the riser for the above gear. In order to explain the method of calculating minimum riser diameter, a 1-in. pattern section of the gear was constructed so that the pads, the 1-in. section and riser could be removed and photographed. By observing Figs. 3 to 5, the method of calculation will be more easily followed:

(1) A 1-in. taper is added from cope to top of bottom flange in the corebox (Figs. 3 and 4).

(2). As the flange is ¾ in. thick, a ¾-in. pad is added to OD of the face. This pad extends from bottom of flange to cope, as shown in Fig. 3.

(3) In order to promote directional solidification a taper is now added to the ¾-in. pad at the rate of 1 in. per foot. In the case of this gear this would be ¾ in. at the cope. Once the padding and taper is determined, it is a relatively simple matter to determine the surface area-volume ratio of a 1-in. section. The surface area dissipating heat is the perimeter of this 1-in. thick section ($8\frac{3}{4}+2+10\frac{1}{4}=21$ sq. in.), and the volume of the 1-in. section can be calculated by dividing the cross section into a series of rectangles and triangles (Fig. 3.)

The volume of the 1 in. thick section of the casting is determined as follows: face of casting, $10\times2=20$ cu. in.; padding in corebox, $\frac{1}{2}\times8=4$; flange pad, $\frac{3}{4}\times9=6.75$; taper, $9\times\frac{3}{8}=3.40$.

The relative freezing rate of this 1-in. section is determined as follows:

$$FR = \frac{21}{20+4+6.75+3.40} = \frac{21}{34.15} = 0.62$$

To find what size riser has a relative freezing rate of 0.62 we may use equation (3) and solve for d:

$$d = \frac{5}{0.62} = 8.0 \text{ in.}$$

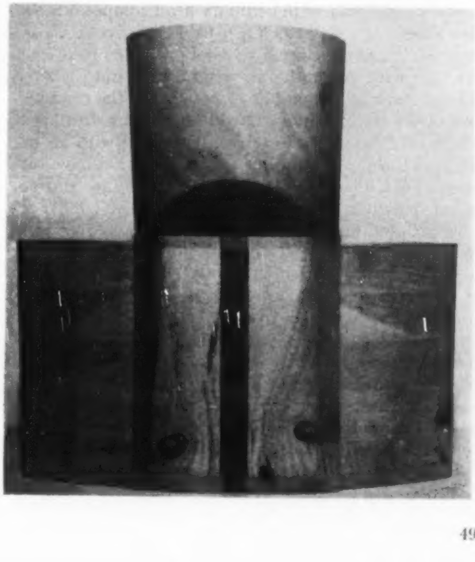
or from Table 1, a 0.62 FR is for an 8-in. riser. Adding a safety factor, an 8½-in. riser will be used.

In conclusion, the writer would like to emphasize that in the two years the above method has been used there has been no shrinkage under all the risers in a gear blank, and no machined gear returned because of shrinkage. Occasionally shrinkage may occur under one or two of the six risers on a gear. This is generally caused by not adding sufficient head compound or other related causes. It is not maintained that the most efficient riser is used as the safety factor may be too great, but we have eliminated the problem of under-riser shrinkage in gear blanks.

APPENDIX

A Theoretical Approach to Dimensioning Risers When an Extremely Potent Exothermic Head Compound Is Employed: The following discussion has had little experimental work to substantiate the theory but scattered results indicate it has merit. It is hoped that those foundries using highly exothermic head compounds will further check the theory as the author's opportunities have

Fig. 5—The tapered pad, 1-in. section, and riser for gear casting are shown in the assembled pattern.



been infrequent. It should be borne in mind that this work has been limited to castings requiring one or two risers.

When a highly exothermic head compound is used, the problem of calculating riser dimensions is entirely different than in the case where an ordinary (non-exothermic) riser compound is used. However, in many cases where the riser dimensions have been determined for applying any one of the many commonly used anti-pipe compounds, the same riser diameters are used with highly exothermic riser compounds. In most cases the diameter is too large and, therefore, an excessive amount of the expensive head compound is used as well as decreasing the possible yield values.[4]

In risering a casting the foundryman is confronted with two problems: (1) having a riser large enough to freeze after the section under the riser is solid; (2) having a sufficient volume of liquid metal to meet the contractional demands of the casting.

With the ordinary type of riser compound, it is axiomatic that if the riser is last to freeze then the volume is sufficient to meet the feed demands of the casting. By the addition of an exothermic head compound a favorable heat gradient from riser to casting can be established and, therefore, the problem is not to determine if the riser diameter is large enough to freeze last, but rather whether the riser is of sufficient volume to meet the feed demands of the casting.

TABLE 2—RISER DIMENSIONS AND WEIGHTS
(when h = 0.4d; h = height; d = diameter)

RISER DIAM., IN.	RISER WT., LB	RISER HEIGHT, IN.	RISER DIAM., IN.	RISER WT., LB	RISER HEIGHT, IN.
8	43	3.0	17	450	7.0
9	63	3.5	18	504	7.0
10	89	4.0	19	602	7.5
11	122	4.5	20	712	8.0
12	160	5.0	21	833	8.5
13	188	5.0	22	918	8.5
14	239	5.5	23	1062	9.0
15	300	6.0	24	1216	9.5
16	370	6.5	25	1390	10.0

Riser Sizes Reduced

It is known that with ordinary head compounds the minimum riser diameter must be 115 per cent of the cross section of the casting to meet problem one above, and that with an exothermic riser compound the riser diameter can be as small as 75 per cent of the cross section of the casting and yet avoid under-riser shrinkage. Therefore, the prime problem in risering with an exothermic head compound is to use risers that have sufficient volume of molten metal to meet the contractional demands of the casting.

Upon solidification steel contracts about 3 per cent and liquid shrinkage is approximately 1 per cent for every 100 F drop in temperature. These values are affected negatively by increasing the chromium or aluminum content, and are increased by increasing carbon, silicon and manganese. The total shrinkage which may be expected in the average steel casting varies between 4½ and 6 per cent. In order to meet the contractional demands of a casting, it is only required to maintain and supply molten metal equal to approximately 5 per cent of the casting weight.

The practical foundryman knows that it is not feasible to feed a casting requiring a single riser from a riser weighing only 5 per cent of the total weight of the casting. With a highly exothermic riser compound it is readily possible to secure a yield of 70 per cent, and in many cases up to 80 per cent. If a 70 per cent yield is satisfactory, then the riser should be approximately 30 per cent of the casting weight, or the riser must weigh 6 times the weight of the contractional demands of the casting.

Riser Dimensions

The height of a riser when an exothermic riser compound is used should be approximately four tenths the diameter, or

$$h = 0.4d \tag{1}$$

Once the weight of the riser has been determined then the problem is to find what diameter riser whose height is equal to 0.4 its diameter and weighs so many pounds. This can be calculated according to the following equation:

$$d = \sqrt[3]{\frac{W}{0.09}} \tag{2}$$

where d = diameter and W = weight of the riser.

Example: If a casting weighing 1500 lb can be fed with a single riser, what diameter riser must be used if an exothermic head compound is applied?

Five per cent of 1500 lb is 75. This is the weight of molten metal needed to meet the feed demands of the casting. If 80 per cent yield appears plausible, then the riser should weigh four times 75 lb or, if 70 per cent appears reasonable, then the riser weight would be six times 75 or 450 lb.

To find the diameter of a riser weighing 450 lb and height of 0.4d, substitute known values in equation (2) and solve for d. Thus:

$$d = \sqrt[3]{\frac{450}{0.09}} = \sqrt[3]{5000} = 17 \text{ in.}$$

$$h = 0.4 \times 17 \text{ or } 6.5 \text{ to } 7 \text{ in.}$$

If the above casting would require two risers, and the same yield (70 per cent) seemed logical, then each riser would weigh 225 lb. Substituting 225 for W in equation (2), the value of d is 13.5 in.

Equation (2) can be eliminated if a table is prepared similar to Table 2. By using the table the approximate diameter can be readily determined, and if more exact results are desired a table in ½-in. increments should be prepared.

In the previous example the riser weight is 450 lb. Referring to Table 2, a 450-lb riser would have a 17-in. diameter, with h = 0.4d.

If the riser is to weigh 225 lb, the table shows that the riser diameter would be greater than 13 and less than 14 in. The necessary riser diameter would be 13½ or 14 in.

References

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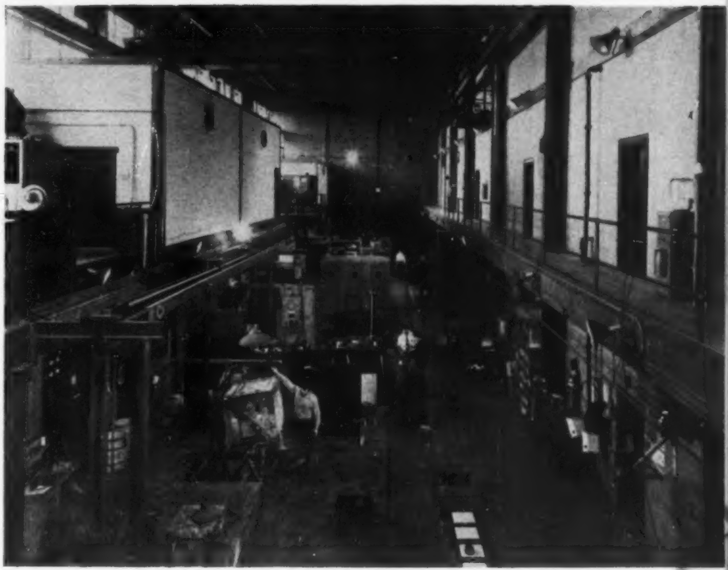
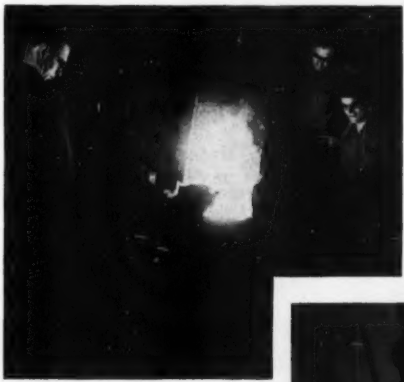
3. Nathan Janco, "Calculating Sizes of Gates and Risers," A.F.S. Transactions, vol. 55, p. 296 (1947).
4. J. W. Mueller and G. A. Bole, "Hot Top Efficiency Improved," *Steel*, Jan. 23, 1950.

MODERN FOUNDRY METHODS

INDUSTRY-SPONSORED RESEARCH



Foundry area in Armour's Metal Research Building. Melting and pouring area is in foreground. Converter and cupola are out of picture at the left.



Pouring 500-lb alloy steel heat from 600-lb capacity induction furnace.

Dilatometer for high temperature work helps in study of molding and core sand behavior at molten metal temperatures.

More and more investigations of foundry technical and production problems are being handled outside of foundries as modern foundries—lacking staff, facilities, or time—look to professional research organizations to help keep the casting process the shortest distance from raw material to finished product.

Such research may consist of (1) development of improved foundry manufacturing processes; (2) development of new materials for use with present processes; and (3) development of processes or methods for production of particular castings or for use of particular metals or alloys.

In this story, R. R. Lubker, associate chairman, Metals Research, Armour Research Foundation, Chicago, tells how special equipment and skills have helped foundries, and describes Armour facilities.

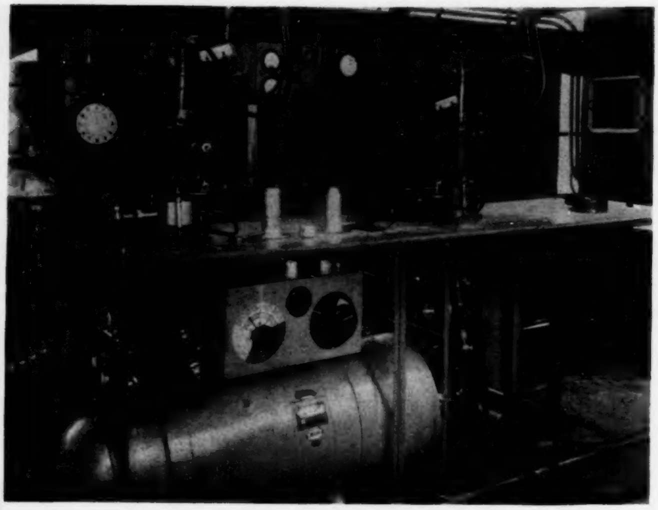
The Metals Department of Illinois Institute of Technology's Armour Research Foundation was first organized in the foundry field in the fall of 1939. The Foundation had started three years before with three scientists operating on a research volume of $40,000. Today, a staff of about 900 annually handles 330 projects worth over $6,200,000. Floor space for all Foundation facilities amounts to about 200,000 sq. ft.

Castings of all types and in a considerable range of sizes are made in the foundry with production ranging from laboratory to pilot plant scale. In a recent pilot plant operation, the last thousand castings under study were given full x-ray inspection as well as metallurgical, chemical, and dimensional inspections. Although the casting had initially been difficult to produce, less than one per cent of the 1,000 were defective.

In addition to complete technical, metallurgical, and mechanical testing laboratories, Armour has a variety of melting equipment and auxiliary facilities for castings production. Furnaces include a series of induction units ranging from 20 to 600-lb capacity, a 3000 lb per hr cupola, a 250-lb rocking indirect arc furnace, and a 1200 lb side-blown converter.

A complete pattern shop and extensive sand facilities are available. Casting cleaning and heat treatment are provided for in a wide range of industrial size equipment.

Casting of titanium and titanium alloys, which have remarkable re-



Furnaces strange to the commercial foundry are essential to research. This non-consumable tungsten electrode arc furnace melts titanium and zirconium alloys in a water-cooled copper crucible. A consumable electrode furnace (not pictured) with an electrode of desired composition made by powder metallurgical techniques is used in vacuum or inert gas to melt refractory and/or reactive metals such as titanium, zirconium, tungsten, and molybdenum.

Small heats of experimental alloys not requiring special melting equipment are handled in small induction furnaces. Armour's induction units range from 20 to 600 lb capacity.

sistance to salt water corrosion, is being investigated for the Bureau of Ships. The Navy is interested in pump casings, pump impellers, and valve parts.

Effect of acoustics vibration on solidification of light metal alloys, under way for the Frankford Arsenal, promises castings with higher properties. A study of shrinkage characteristics of zinc base alloys for aircraft dies carried out for the Air Materiel Command has led to closer tolerances through chilling and mold insulation to control solidification.

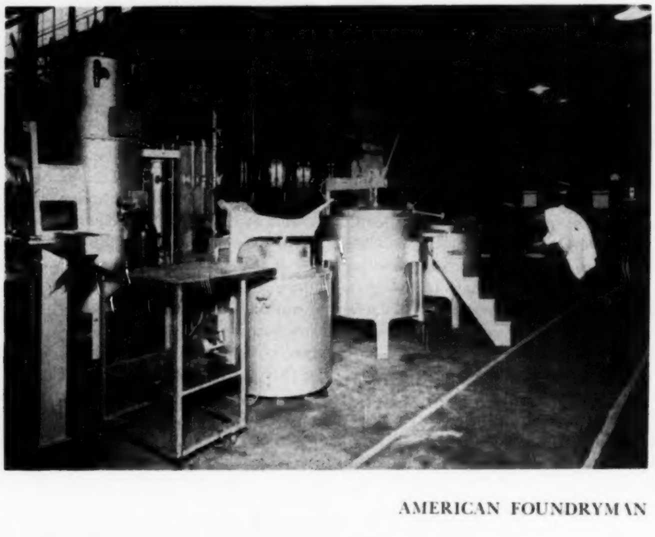
Assistance is given on a continuing basis to the foundry research program of American Steel Foundries. Last year this was directed toward hardening of steam hammer piston rods, development of an improved impact test specimen for armor plate, and study of fluid flow by high speed photography of low melting alloys in transparent molds.

Other projects sponsored by American Steel Foundries include the determination of pressure and analysis of mold cavity gases during pouring and solidification, and the development of a method for predicting flow through gating systems within about five per cent and for calculating mold filling time within practical limits.

Development of a test specimen for study of hot tearing in steel castings is under the joint sponsorship of the American Foundrymen's Society and American Steel Foundries.

Use of metallic sodium for deoxi-

Furnaces in the heat treating laboratory give controlled heating and cooling of castings in any atmosphere.



High speed motion picture camera above hollow pyramid records flow of molten steel in gates and molds.

Tapping test heat of gray iron. Note radiation pyrometer at right recording metal temperature in well. Oxygen generator at bottom of page was used for studying the advantages of oxygen-enriched blast for the cupola. Side-blown converter in rear has capacity of 1200 lb.

dation and desulphurization of molten steel were studied for National Distillers Products Corp., and Omaha Steel Works instituted a quality control program with Armour assistance. Steel-making research has been carried on with the side-blown converter.

Synthetic resins for cores have been studied under industrial sponsorship, testing being conducted in the laboratory and on the pouring floor. A project initiated by the Steel Founders' Society of America evaluated molding materials in terms of solidification rates of steel. Another SFSA project was a photographic study of steel flowing into sand molds. This study verified some old ideas, showed others to be erroneous, and provided graphic verification of theoretical results from other studies on steel flow.

An extensive program on casting characteristics and mechanical properties of aluminum-beryllium alloys was completed for the Navy Bureau of Aeronautics. Information was obtained on refractories and melting procedures. These alloys are primarily of interest because of their unique combination of relatively good tensile properties for a lightweight alloy, and because of their high modulus of elasticity. Their high strengths at moderate temperatures are also important.

A successful centrifugal method was developed for casting an abrasion-resisting alloy on the inside of slush pump liners for Harrisburg Steel Corp. After an extensive abrasion-testing study of a large number of alloy compositions, one was selected which combined a high degree of abrasion resistance with desirable casting characteristics. Field test studies on actual liners correlated nicely with laboratory results.

National President Walter L. Seelbach, Superior Foundry, Inc., Cleveland (second from left) is welcomed to Michigan State College by Engineering Dean L. G. Miller. At left is L. C. Price, head, MSC Mechanical Engineering Department. Second from right is Regional Conference Co-Chairman C. C. Sigerfoos.

Past President F. J. Walls, International Nickel Co., Detroit, examines tank casting specification with (starting left) Prescott L. Goud, Detroit Tank Arsenal, Harry K. Herschman, Metallurgical and Conservation Branch, National Production Authority, Washington, D.C., and Capt. Joseph E. Black, Detroit Tank Arsenal.

SHELL, PERMANENT, SAND MOLDS HIGHLIGHT MICHIGAN REGIONAL

THIS YEAR's Michigan Regional Foundry Conference featured technical sessions on strategic materials, casting methods, sand problems, and quality control. Held at Michigan State College, October 11 and 12, the conference program also included banquet addresses by National President Walter L. Seelbach, Superior Foundry, Inc., Cleveland, and E. C. Prophet, MSC geography professor.

Technical highlight of the 1951 Michigan Regional was the session on casting methods in which speakers compared sand, permanent, and shell mold methods, advantages, and disadvantages.

The conference was opened in the Kellog Center Auditorium the morning of October 11, by Prof. C. C. Sigerfoos who called on Engineering Dean L. G. Miller and Prof. L. C. Price, Mechanical Engineering Department head, for welcoming remarks. Dean Miller said that engineering colleges would not be able to meet more than half of industry's needs for graduates. He urged foundrymen to encourage and help students to enter college and to extend the same encouragement to men already in industry.

Prof. Price described the change in pattern of inventions from the past when most were started by practical men, with technical men later taking them up and developing their technology. Today, he pointed out, most inventions start with a team of technical men working in a research and development laboratory.

At the first technical session F. J. Walls, International Nickel Co., Detroit presided and the following speakers appeared: Prescott L. Goud, Detroit Tank Arsenal, speaking on *"Requirements of the Armed Forces;"* Capt. Joseph L. Black, Detroit Tank Arsenal, *"Non-Ballistic Tests of Armor Castings;"* and Harry K. Herschman, National Production Authority, Washington, D. C., discussing *"Civilian Requirements and Availability."*

Mr. Goud said that steel armor castings procurement was a serious problem and urged more small foundries to get into the small castings field. Present big demand is in the 50 to 100 lb. sizes. Because of shortages, he warned, conversion is under way to forgings and weldments even though castings are preferred because of the ease in achieving unusual contours and the lower cost involved.

Capt. Black described the types of failure of armor of various hardnesses under impact by under-matched, matched, and over-matched projectiles. Charpy impact tests are run at –40 F to simulate high velocity impact, he said, and he told how foundrymen can develop their own test specimens to correlate specific practice with castings being produced.

Mr. Herschman outlined the problems of keeping both military and civilian production going and told how to prepare and file melt sheets. He urged closer control of non-alloyed irons to get properties close to the low alloy irons, thus conserving scarce alloys.

Following lunch the technical meetings were resumed in the Union Building, with the afternoon being devoted to a discussion of sand, permanent mold, and shell mold castings. David W. Boyd, Engineering Castings, Inc., Marshall, Mich., was meeting chairman.

Bruno Darin, Ford Motor Co., Dearborn, Mich., spoke on sand castings, discussing synthetic and natural sand practice, and sand reclamation. He advocated higher molding pressures than many foundrymen are now using. He warned against discarding traditional sand practices for new methods and urged his listeners to use simple sand mixes, practice sand control, and analyze each casting as a heat transfer problem.

Howard U. McClelland, Eaton Mfg. Co., Vassar, Mich., traced the development of his company's process from 1923 when it started making permanent mold carburetor castings. He described the mold prep-

aration, pouring, and casting removal cycle of the 12-mold casting machines used, explaining that gate width is the only variable in gating. Castings are annealed to develop desired mechanical properties, the speaker said.

Richard Herold, Borden Co., New York, stated that the shell molding process was not intended to replace green sand or permanent mold processes. All metals can be cast in shell molds, he said, although low carbon steels and high-lead bronzes give some trouble. Curing cycles for shells have been reduced to some 20 seconds by using oven temperatures well above the charring point of the resin binders.

At the conference banquet the evening of October 11, National President Seelbach told of his recent visit to Europe and his participation in the 1951 International Foundry Congress (page 38). He outlined plans for next year's International when A.F.S. will play host to foundrymen from all over the world. The 1952 International is being planned around the theme "Every Foundry in '52," he said, with representation from every foundry in North America expected at the technical sessions and exhibits.

Prof. Prophet described the problems of metal and ore procurement and the distribution of raw materials deposits in his talk *"Geography in the News."* Toastmaster was Jess Toth, Harry W. Dietert Co., Detroit.

The morning technical session on October 12 covered sand problems. Chairman of the session was C. W. Hockman, Cadillac Motor Car Div., General Motors Corp., Detroit, who reminded the audience of the transition from the old "feel" test methods to modern sand control in introducing the first speaker, Frank S. Brewster, Harry W. Dietert Co.

Mr. Brewster showed laboratory test results and test castings to demonstrate causes and cures for rat tails, veining, scabs, buckles, and excessive metal shrinkage. Less expansion defects occur with higher proportions of cereal binder, wood flour, sea coal, and clay, he said. A high expansion sand must have low hot strength in order to permit the expansion to occur without causing defects, he explained. Expansion is difficult to control, he declared, but hot strength can be adjusted.

Clyde A. Sanders, American Colloid Co., Chicago, stressed the importance of keeping sand test equipment in good operating condition and the value of making simple sand tests. In his talk, *"What Are the Most Important Green Sand Properties to Control in Making a Mold?"* he discussed green compression, moisture, permeability, and mold hardness, citing the relationship of ramming to these properties. Referring to hot sand problems encountered in continuous casting systems, he urged foundrymen to have in their systems, sand equal to five times the weight of the metal poured daily.

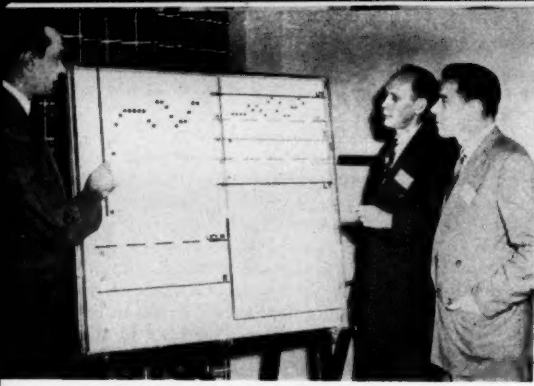
J. D. Johnson, Archer-Daniels-Midland Co., Minneapolis, recommended using the minimum binder that will give the required green and baked strengths in cores in discussing *"Core Sands and Binders."* The criterion for choosing a core oil should be its performance in the foundry, he said. Oil bakability tests in which a 4-in. cube of coresand is baked and examined for bake-through should not be made with cereal in the mixture because it masks the baking of the oil. Preliminary tests show, he declared, that a high density sand bakes faster than a high permeability sand.

Cereal binders are primarily for green strength, said Johnson, but also contribute to baked strength. He emphasized the importance of the water to cereal ratio and stated that a 3 to 1 ratio gives the best green strength with good workability.

The afternoon session, last of the conference, was on quality control and was under the chairmanship of Robert E. Schenck, Aluminum Co. of America, Detroit. In introducing the speakers he pointed out that while quality control was not new to the foundry there were quality control techniques new to some foundrymen.

A. A. Evans, International Harvester Co., Indianapolis, Ind., spoke on *"Statistical Quality Control."* Foundries, he said, practice less control than some other industries because of their early secretiveness

Richard Herold, Borden Co., New York (left), shows Charles Rittinger, American Car & Foundry, Detroit, a shell mold for casting a pipe ell after talk and discussion of shell molding techniques. At right, speakers and chairman of sand session discuss program. They are (left to right) Chairman C. Hockman, Cadillac Motor Car Div., General Motors Corp., Detroit, Clyde A. Sanders, American Colloid Co., Chicago, Frank S. Brewster, Harry W. Dietert Co., Detroit, and J. D. Johnson, Archer-Daniels-Midland Co., Minneapolis.



Studying quality control chart are (left to right) A. A. Evans, International Harvester Co., Indianapolis, Ind., Robert E. Schenck, Aluminum Co. of America, Detroit, and Stanley Sherwood, Cadillac Motor Car Div., GMC. Conference photos are by MSC Students Burl Romick, Carl Romick, and Joseph Carrow.

and tendency in the past to operate as an art, on a trial and error basis. Statistical quality control permits isolation of any one of numerous variables and will work in any foundry where processes are repetitive, he declared. He showed quality control charts and explained how to use them, and told how in one instance they reduced scrap five per cent.

In his talk on *"Foundry Quality Control"* S. Sherwood, Cadillac Motor Car Div., General Motors Corp., Detroit, outlined control practices at Cadillac.

Arrangements for the 1951 Michigan Regional Foundry Conference were under the direction of Prof. Austen J. Smith and Prof. C. C. Sigerfoos representing the Central Michigan Chapter and Michigan State College. Working with them were: Prof. L. C. Price, Michigan State College; Thomas T. Lloyd, Albion Malleable Iron Co., Albion, Mich., Central Michigan Chapter; Vaughn C. Reid, City Pattern Foundry & Machine Co.. and Jess Toth, Harry W. Dietert Co., Detroit, Detroit Chapter; Raymond H. Klawuhn, General Foundry & Mfg. Co., Flint, Mich., and Kenneth H. Priestley, Vassar Electroloy Products, Inc., Vassar, Mich., Saginaw Valley Chapter; and Ross P. Shaffer, Lakey Foundry & Machine Co., and Stanley H. Davis, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., Western Michigan Chapter.

Commemorate Founding of American Malleable Iron On 125th Anniversary

Malleable founders celebrated the founding of black heart malleable iron September 20 and 21 in Cleveland when Malleable Founder's Society members gathered to mark the work of Seth Boyden culminating July 4, 1826 in the first American malleable iron. Presiding over the two-day meeting was MFS President Cal. C. Chambers, Texas Foundries, Inc., Lufkin.

At the outset, Boyden had a small shop with a few helpers in Newark, N. J. Today 100 companies in 113 foundries located in 19 states and in Canada employ nearly 40,000 workers to produce more than one million tons of malleable annually.

ALUMINUM

Alloy Recommendation Committee
Aluminum and Magnesium Division
American Foundrymen's Society

Increasing demand by users of aluminum and magnesium castings for a guide to and in selection of alloys for particular applications led to the establishment several years ago of an Alloy Recommendation Committee by the Aluminum and Magnesium Division of A.F.S. This Committee has, with the aid of other committees of this Division, collected considerable data toward the preparation of such a guide, and has developed various tabular forms for ready presentation of such data.

The accompanying tables, assembling certain of these data for aluminum alloy products, are presented here for comment and discussion. Later, a complete guide, including the physical and mechanical properties of the various alloys involved and recommended uses, will be made available.

Only those aluminum alloys covered by existing ASTM specifications for sand, permanent mold and die castings are tabulated. Part A of Tables 1, 2 and 3 list these alloys by ASTM designation and define their nominal composition. In addition, commercial designations for the various alloys and similar specifications of other agencies are provided for comparative purposes. For detailed compositions, as well as for other requirements, reference should be made to the specification covering the specific alloy.

Part B of these tables include certain foundry and other outstanding characteristics which are usually considered in the selection of an alloy for a specific application. Such characteristics are rated from (1) to (5), (1) being the best and (5) the poorest of the group.

In applying these ratings it has been assumed that, to warrant inclusion in a specification, an alloy must have demonstrated sufficiently good production characteristics to have been accepted by foundry producers. Hence a rating of (5) still indicates a commercial foundry alloy, although in certain cases its application may be limited to specific types of castings.

The Committee realizes that these ratings may be controversial among foundrymen and will be affected by the individual experiences of each foundry with a particular alloy. To be sure, therefore that these preliminary ratings represent the best judgment of foundrymen as a whole, they are presented for review and discussion. The Committee solicits the comments of all who are interested or have data to contribute on this project. Such comments should be addressed to American Foundrymen's Society Headquarters, attention S. C. Massari, Technical Director, 616 So. Michigan Ave., Chicago 5, Ill.

It is not proposed or expected that the use of charts, such as exhibited here, will replace the normally recommended cooperation between casting designers and foundrymen. A designer will still benefit through discussion of his casting design and requirements with the ultimate producer, before establishing final design and alloy requirements.

ALLOY CHARACTERISTICS

TABLE 1—PART A—SAND CAST ALUMINUM ALLOYS—COMPOSITIONS AND SPECIFICATIONS

A.S.T.M. Alloy Specification B26-50T	Nominal Composition, %								Commercial Designation	Similar Specifications For Comparative Purposes			
										Federal	U.S. Navy	S.A.E.	
	Cu	Si	Mg	Zn	Ni	Mn	Cr	Ti		QQ-A-601a	46Alf	Handbook(1951)	A.M.S.(f)
C4A	4.5	-	-	-	-				195	Class 4	Class 4	38	4230 4231A
CG100A	10.0	-	0.2	-	-				122	Class 7	-	34	-
CN42A	4.0	-	1.5	-	2.0				142	Class 6	-	39	4222B
CS43A	4.0	3.0	-	-	-				108	Class 8	-	-	-
CS72A	7.0	2.0	-	-	-				113	Class 9	-	33	-
G4A	-	-	4.0	-	-				214	Class 5	Class 5	320	-
G10A	-	-	10.0	-	-				220	Class 16	-	324	4240A
GS42A	-	1.8	4.0	-	-				B214	-	-	-	-
S5A(b)	-	5.0	-	-	-				43	Class 2	Class 2	35	-
S5B(c)	-	5.0	-	-	-				5% Si	-	-	-	-
SC51A	1.3	5.0	0.5	-	-				355	Class 10	Class 7	322	4210D 4212C 4214B
SC64B(d)	3.7	6.3	-	-	-					-	-	-	-
SC64C(e)	3.7	6.3	-	-	-				319	Class 18	-	329	-
SC82A	1.5	8.0	0.4	-	-	0.4			Red X-8	-	-	327	-
SG70A	-	7.0	0.3	-	-				356	Class 3	Class 3	323	4217A
ZC81A	0.7	-	0.4	7.5	-				Tenzaloy	-	-	-	-
ZG32A	-	-	1.6	3.0	-	0.5	0.3		Ternalloy 5	-	-	-	-
ZG42A	-	-	2.1	4.3	-	0.5	0.3		Ternalloy 7	-	-	-	-
ZG61A	-	-	0.55	5.6	-	-	0.5	0.2	40E	Class 17	Class 1	310	-
ZG61B	0.5	-	0.7	6.5	-				A612	-	-	-	-

(a) For specified compositions refer to applicable specifications.
(b) Copper, 0.1% max.
(c) Copper, 0.3% max. for cooking utensils. Other uses, 0.6% max.
(d) Iron, 1.0% max., magnesium, 0.1% max.
(e) Iron, 1.2% max., magnesium, 0.5% max.
(f) Aeronautical Materials Specifications

TABLE 1—PART B—SAND CAST ALUMINUM ALLOYS—PROPERTIES AND CHARACTERISTICS

A.S.T.M. Alloy Specification B26-50T	Pattern Shrinkage Allowance, In./In.(m)	Approx. Melting Range, F	Foundry Characteristics					Other Characteristics								
			Resistance to(a) Hot Cracking	Pressure Tightness	Fluidity (b)	Solidification(c) Shrinkage Tendency	Normally Heat Treated	Resistance to(d) Corrosion	Machining(e)	Polishing(f)	Electroplating (g)	Anodizing(h) (Appearance)	Chemical(i) Oxide Coating (Protection)	Strength at(j) Elevated Temp.	Suitability(k) for Welding	Suitable (l) for Brazing
C4A	5/32	970-1190	4	4	3	3	Yes	3	2	2	1	2	3	3	3	No
CG100A	5/32	965-1155	3	3	3	3	Yes	4	1	2	1	3	4	1	4	No
CN42A	5/32	990-1175	4	3	3	4	Yes	4	2	2	1	3	4	1	4	No
CS43A	5/32	970-1160	2	2	2	2	No	4	3	3	2	3	3	3	2	No
CS72A	5/32	965-1160	3	3	2	3	No	5	2	2	2	3	4	3	3	No
G4A	5/32	1110-1185	4	5	5	5	No	1	1	1	5	1	1	2	4	No
G10A	1/10	840-1120	2	5	4	5	Yes	1	1	1	4	1	1	5	5	No
GS42A	5/32	1090-1170	3	4	3	4	No	1	2	2	4	2	1	3	4	No
S5A	5/32	1065-1170	1	1	1	1	No	2	5	5	2	5	2	4	1	Ltd.
S5B	5/32	1065-1170	1	1	1	1	No	3	5	5	2	5	2	4	1	Ltd.
SC51A	5/32	1015-1150	1	1	1	1	Yes	3	3	3	1	4	2	2	2	No
SC64B	5/32	950-1125	2	2	2	2	Yes	3	3	4	2	4	3	3	2	No
SC64C	5/32	960-1120	2	2	2	2	Yes	3	3	4	2	4	3	3	2	No
SC82A	5/32	960-1135	1	1	1	1	Yes	3	4	5	2	4	2	2	2	No
SG70A	5/32	1035-1135	1	1	1	1	Yes	2	4	5	2	4	2	3	2	No
ZC81A	3/16	-	5	4	4	4	Aged Only	2	1	1	2	2	3	5	4	Yes
ZG32A	3/16	1025-1175	5	4	4	4	Aged Only	2	1	1	3	2	2	5	4	Yes
ZG42A	3/16	1020-1165	5	4	4	4	Yes	2	1	1	3	2	2	5	4	Yes
ZG61A	3/16	-	5	4	4	4	Aged Only	2	1	1	2	2	3	5	4	Yes
ZG61B	3/16	1105-1195	5	4	4	4	Aged Only	2	1	1	2	2	3	5	4	Yes

Notes: (See text for discussion of ratings; 1 indicates best of group, 5 indicates poorest of group.)

(a) Ability of alloy to withstand contraction stresses while cooling through hot-short or brittle temperature range.

(b) Ability of liquid alloy to flow readily in mold and fill thin sections.

(c) Decrease in volume accompanying freezing of alloy and measure of amount of compensating feed metal required in form of risers.

(d) Based on alloy resistance in standard type salt spray test.

(e) Composite rating based on ease of cutting, chip characteristics, quality of finish and tool life. Ratings, in the case of heat-treatable alloys, based on -T6 type temper. Other tempers, particularly the annealed temper, may have lower rating.

(f) Composite rating based on ease and speed of polishing and quality of finish provided by typical polishing procedure.

(g) Ability of casting to take and hold an electroplate applied by present standard methods.

(h) Rated on lightness of color, brightness and uniformity of clear anodized coating applied in sulphuric acid electrolyte.

(i) Rated on combined resistance of coating and base alloy to corrosion.

(j) Rating based on tensile and yield strengths at temperatures up to 500 F, after prolonged heating at testing temperature.

(k) Based on ability of material to be fusion-welded with filler rod of same alloy.

(l) Refers to suitability of alloy to withstand brazing temperatures without excessive distortion or melting.

(m) Allowances for average castings. Shrinkage requirements will vary with intricacy of design and dimensions.

TABLE 2—PART A—PERMANENT MOLD CAST ALUMINUM ALLOYS— COMPOSITIONS AND SPECIFICATIONS

A.S.T.M Alloy Specification B108-50T	Nominal Composition, %								Commercial Designation	Similar Specifications for Comparative Purposes			
										Federal	Military	S.A.E.	
	Cu	Si	Mg	Zn	Ni	Mn	Cr	Ti		QQ-A-596a	Mil-A-958A	Handbook(1951)	A.M.S.
CG100A	10.0	-	0 25	-	-				122	Class 2	Class 2	34	-
CN42A	4.0	-	1.5	-	2.0				142	Class 3	Class 3	39	-
CS42A	4.5	2.5	-	-	-				B195	Class 4	Class 4	380	4282B 4283
CS66A	6.5	5.5	0.4	-	-				152	-	-	300	-
CS72A	7.0	2.5	-	-	-				113	Class 1	Class 1	33	-
CS104A	10.0	4.0	1.0	-	-				138	-	-	-	-
GS42A	-	1.8	4.0	-	-				B214	-	-	-	-
GZ42A	-	-	4.0	1.8	-				A214	-	-	-	-
S5A(b)	-	5.0	-	-	-				43	Class 7	Class 7	35	-
S5B(c)	-	5.0	-	-	-				5%Si	-	-	-	-
SC51A	1.3	5.0	0.5	-	-				355	Class 6	Class 6	322	4280B 4281
SC64A	4.5	5.5	-	-	-				A108	Class 5	Class 5	330	-
SC64B(d)	3.7	6.3	-	-	-					Class 11	-	326	-
SC64C(e)	3.7	6.3	-	-	-				319	-	-	-	-
SC122A	1.5	12.0	0.7	-	-	0.7			Red X-13	-	-	328	-
SG70A	-	7.0	0.3	-	-				356	Class 8	Class 8	323	4284A
SN122A	1.0	12.0	1.0	-	2.5				A132	Class 9	Class 9	321	-
ZC60A	0.5	-	0.35	6.5	-				C612	-	-	-	-
ZC81B	0.7	-	0.35	7.5	-				Tenzaloy	-	-	-	-
ZG32A	-	-	1.6	3.0	-	0.5	0.3	-	Ternalloy 5	-	-	-	-
ZG42A	-	-	2.1	4.3	-	0.5	0.3	-	Ternalloy 7	-	-	-	-

(a) For specified compositions refer to applicable specifications.
(b) Copper, 0.1% max.
(c) Copper, 0.3% max. for cooking utensils. Other uses, 0.6% max.
(d) Iron, 1.0% max., magnesium, 0.1% max.
(e) Iron, 1.2% max., magnesium, 0.5% max.

TABLE 2—PART B—PERMANENT MOLD CAST ALUMINUM ALLOYS— PROPERTIES AND CHARACTERISTICS

A.S.T.M. Alloy Specification B108-50T	Approximate Melting Range, F	Foundry Characteristics					Other Characteristics								
		Resistance to Hot Cracking (a)	Pressure Tightness	Fluidity (b)	Solidification Shrinkage Tendency (c)	Normally Heat Treated	Resistance to Corrosion (d)	Machining (e)	Polishing (f)	Electroplating (g)	Anodizing (Appearance) (h)	Chemical Oxide Coating (Protection) (i)	Strength at Elevated Temp. (j)	Suitability for Welding (k)	Suitable for Brazing (l)
CG100A	965-1155	4	4	3	4	Yes	5	1	2	1	3	4	1	4	No
CN42A	990-1175	4	4	3	4	Yes	4	2	2	1	2	3	1	4	No
CS42A	970-1170	4	3	3	3	Yes	4	3	2	1	3	2	2	4	No
CS66A	930-1110	2	3	3	3	Yes	5	3	2	2	4	3	2	4	No
CS72A	965-1160	3	3	2	3	No	5	2	2	2	3	4	3	4	No
CS104A	945-1110	2	3	2	3	No	5	2	2	5	4	5	2	3	No
GS42A	1090-1170	3	4	4	4	No	1	1	1	5	2	1	3	5	No
GZ42A	1075-1180	4	5	5	4	No	1	1	1	4	1	1	3	5	No
S5A	1065-1170	1	1	1	2	No	2	5	4	2	4	2	4	1	Ltd.
S5B	1065-1170	1	1	1	2	No	3	5	4	2	4	2	4	1	Ltd.
SC51A	1015-1150	1	1	2	2	Yes	3	3	3	2	4	2	2	2	No
SC64A	970-1135	2	2	2	2	No	4	3	3	2	3	3	3	2	No
SC64B	950-1125	2	2	2	3	Yes	3	3	3	2	4	3	3	2	No
SC64C	960-1120	2	2	2	3	Yes	3	3	3	2	4	3	3	2	No
SC122A	980-1060	1	2	1	3	Yes	3	4	5	3	5	2	2	2	No
SG70A	1035-1135	1	1	2	1	Yes	2	3	3	1	4	2	3	2	No
SN122A	1000-1050	1	2	1	3	Yes	3	4	5	4	5	2	2	2	No
ZC60A	1120-1190	5	5	4	5	Aged Only	2	1	1	2	1	2	5	4	Yes
ZC81B	-	5	5	4	5	Aged Only	2	1	1	2	1	2	5	4	Yes
ZG32A	1138-1197	5	5	4	5	Aged Only	2	1	1	3	1	2	5	4	Yes
ZG42A	1136-1197	5	5	3	5	Yes	2	1	1	3	1	2	5	4	Yes

Notes (See text for discussion of ratings. 1 indicates poorest of group.)

(a) Ability of alloy to withstand stresses from contraction while cooling through hot-short or brittle temperature range.

(b) Ability of liquid alloy to flow readily in mold and fill thin sections.

(c) Decrease in volume accompanying freezing of alloy and measure of amount of compensating feed metal required in form of risers.

(d) Based on resistance of alloy in standard type salt spray test.

(e) Composite rating based on ease of cutting, chip characteristics, quality of finish and tool life. Ratings, in the case of heat-treatable alloys, based on -T6 type temper Other tempers, particularly the annealed temper, may have lower rating.

(f) Composite rating based on ease and speed of polishing and quality of finish provided by typical polishing procedure.

(g) Ability of casting to take and hold an electroplate applied by present standard methods.

(h) Rated on lightness of color, brightness and uniformity of clear anodized coating applied in sulphuric acid electrolyte.

(i) Rated on combined resistance of coating and base alloy to corrosion.

(j) Rating based on tensile and yield strengths at temperatures up to 500 F, after prolonged heating at testing temperature.

(k) Based on ability of material to be fusion-welded with filler rod of same alloy.

(l) Refers to suitability of alloy to withstand brazing temperatures without excessive distortion or melting.

TABLE 3—PART A—DIE CAST ALUMINUM ALLOYS—COMPOSITIONS AND SPECIFICATIONS

A. S. T. M. Alloy Specification B85-50T	Nominal Composition, %				Commercial Designation	Similar Specifications for Comparative Purposes			
	Cu	Si	Mg			Federal QQ-A-591a	Military MIL-A-15153 (Ships)	S. A. E. Handbook (1951)	S. A. E. A. M. S.
G2	-	-	8.0		218	Class 7	Class 7	-	-
S4	-	5.0	-		43	Class 3	Class 3	304	-
S5	-	12.0	-	Fe, 2.0 max.	13	Class 1	Class 1	305	4290D
S9	-	12.0	-	Fe, 1.3 max.	A13	Class 2	-	-	-
SC2	3.5	5.0	-	Fe, 2.0 max.	85	Class 5	Class 5	307	-
SC5	3.5	5.0	-	Fe, 1.3 max.	A85	Class 5A	-	-	-
SC6	3.5	8.5	-	Fe, 1.3 max.	A380	Class 10	Class 10	306	4291
SC7	3.5	8.5	-	Fe, 2.0 max.	380	Class 11	-	308	-
SG2	-	9.5	0.5	Fe, 1.3 max.	A360	-	Class 9	-	-
SG3	-	9.5	0.5	Fe, 2.0 max.	360	Class 12	-	309	4290D

(a) For specified compositions refer to applicable specifications.

TABLE 3—PART B—DIE CAST ALUMINUM ALLOYS—PROPERTIES AND CHARACTERISTICS

A. S. T. M. Alloy Specification B85-50T	Approximate Melting Range, F	Foundry Characteristics				Other Characteristics								
		Resistance to Hot Cracking (a)	Pressure Tightness	Mold-Filling Capacity (b)	Normally Heat Treated (c)	Resistance to Corrosion (d)	Machining (e)	Polishing (f)	Electroplating (g)	Anodizing (Appearance) (h)	Chemical Oxide Coating (Protection) (i)	Strength at Elevated Temp. (j)	Suitable for Welding	Suitable for Brazing
G2	995-1150	5	5	4		1	1	1	5	1	1	4	No	No
S4	1065-1170	2	3	3		3	5	4	2	4	3	5	No	No
S5 (k)	1065-1080	1	2	1		3	4	5	3	5	3	3	No	No
S9 (k)	1065-1080	1	2	1		3	4	5	3	5	3	3	No	No
SC2	990-1135	4	3	5		5	2	2	4	2	5	3	No	No
SC5	990-1135	4	3	5		5	2	2	4	2	5	3	No	No
SC6	1000-1100	2	2	2		4	3	3	1	3	5	2	No	No
SC7	1000-1100	2	2	2		4	3	3	1	3	5	2	No	No
SG2	1035-1105	1	1	1		2	3	3	1	3	3	3	No	No
SG3	1035-1105	1	1	1		2	3	3	1	3	3	1	No	No

Notes: (See text for discussion of ratings; 1 indicates best of group, 5 indicates poorest of group.)

(a) Ability of alloy to withstand stresses from contraction while cooling through hot-short or brittle temperature range.

(b) Ability of liquid alloy to flow readily in mold and fill thin sections.

(c) Heat treatments generally confined to low-temperature to provide stress relief or increased ductility. Treatments to improve properties not generally applicable.

(d) Based on resistance of alloy in standard type salt spray test.

(e) Composite rating based on ease of cutting, chip characteristics, quality of finish and tool life.

(f) Composite rating based on ease and speed of polishing and quality of finish provided by typical polishing procedure.

(g) Ability of casting to take and hold an electroplate applied by present standard methods.

(h) Rated on lightness of color, brightness and uniformity of clear anodized coating applied in sulphuric acid electrolyte.

(i) Rated on combined resistance of coating and base alloy to corrosion.

(j) Rating based on tensile and yield strengths at temperatures up to 500 F, after prolonged heating at testing temperature.

(k) Ratings of these alloys based on use of "gooseneck" die-casting machine. Ratings of other alloys for "cold-chamber" machine.

Foundry Education Foundation Lays Permanent Financing Program Plans

Four years old and still growing in the field of foundry education in engineering colleges, the Foundry Educational Foundation is embarking on a new method of financing. Existing on contributions since incorporation February 28, 1947, the Foundation now turns to a five-point finance plan designed to insure the flow of foundry-trained college men into the foundry industry and to assist engineering schools.

The program for permanent financing of FEF "reflects the expressed need and encouragement of many foundrymen" according to FEF President John M. Price, Ferro Machine & Foundry Co., Cleveland. Money will be obtained through:

1. Memberships—companies and persons can become members of FEF. Minimum annual membership is $100.00 with membership fee being based primarily on company employment. Present contributors will be issued paid-up membership certificates.

2. Contributions—present members and friends are being urged to supplement their present support where possible.

3. Gifts—gifts to FEF are non-taxable as long as they come out of personal or corporate funds other than income for the current year.

4. Foundations—FEF intends to seek the aid of existing charitable, scientific, educational and similar foundations.

5. Endowment—plans are being developed for an endowment fund to be established through gifts and bequests to the Foundry Educational Foundation.

UNITED STATES and CANADIAN

FOUNDRYMEN HOLD NORTHWEST REGIONAL MEET AT VANCOUVER

Norman E. Hall
Electric Steel Foundry Co.
Portland, Oregon
Conference Reporter-Photographer

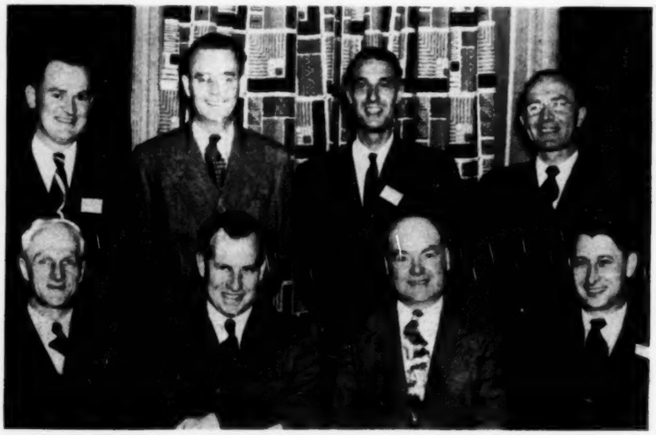
"Children of a Common Mother," as symbolized by the Arch of Peace between the United States and Canada shown above, and of a common interest—advancement of the foundry industry—met October 5 and 6 at the Pacific Northwest Regional Foundry Conference, Vancouver, B. C., Canada. Host to its co-sponsors of the Conference, the A.F.S. Washington and Oregon Chapters and Oregon State College Student Chapter, was the A.F.S. British Columbia Chapter.

Opening the two-day Conference at 530 p.m., October 5, was a fellowship hour that gave foundrymen an opportunity to renew old acquaintances and make new friends. Following this, foundrymen and their wives opened the Conference Banquet with toasts to the King and to the United States. First speaker on the Banquet program was A.F.S. National Secretary-Treasurer Wm. W. Maloney, who outlined plans for the 1952 International Foundry Congress & Show next May.

Oscar R. Olson, chairman of the Metal Trades Section of the Canadian Manufacturers Association, welcomed Conference delegates, and said that the Association realizes the importance of A.F.S. to Canadian industry and is prepared to assist in carrying out the Society's research programs.

Highlight of the evening was A.F.S. National Vice-President I. R. Wagner's talk on *"Tools, Techniques and Taxes,"* in which he stressed the importance of sound techniques in the foundry industry. A.F.S., he said, provides an interchange of castings technology that improves the foundry industry, its employee standards and its product.

Technical sessions, held in the University of British Columbia's Physics Building, opened Saturday morning, October 6, with an address of welcome by Dean Goerd, principal of the Vancouver Vocational Institute. Several years ago, Mr. Goerd said, it was impossible to get five Vancouver foundrymen to sit down at a table and do anything but fight over competition. Today, these same foundrymen are meeting at the Northwest Regional to discuss foundry problems to their mutual advantage, he concluded. Morning session chairman was Lovick P. Young, A-1 Iron & Steel Co.



Northwest Regional Foundry Conference Committee members, all of A.F.S. British Columbia Chapter, were, left to right, seated: J. A. Dickson, General Conference Chairman William M. Armstrong, Garnet Innes and Herbert Heaton. Standing, left to right: Howard Havies, William M. Holeton, Lovick P. Young and Frank E. Godwin.

First session speaker S. F. Gertsman, Department of Mines and Technical Surveys, Ottawa, Ont., in discussing *"Metal Penetration in the Steel Foundry"* outlined factors that must be considered in investigating metal penetration and described the standard casting used in these studies. While investigation results are not yet conclusive, he said, such factors as low pouring temperatures, good ramming, increased amounts of silica flour in cores, and use of good, well-dried washes help materially in overcoming metal penetration.

Second speaker, A.F.S. National Director A. M. Ondreyco, Vulcan Foundry Co., Oakland, in discussing *"Modern Cast Iron Manufacturing—Properties and Applications"* described casting of gray and nodular irons. His foundry, the speaker said, is consistently producing 40,000-lb tensile strength iron and has made a 120,000-lb strength test bar. Research, Mr. Ondreyco concluded, at its present rate of development and discovery will probably produce even stronger irons in the near future.

Concluding the morning session was showing of a film on the powder washing process for cleaning castings to close tolerances.

Presiding at the luncheon at the University's Faculty Club, James A. Dickson, Dickson Foundry Co., Vancouver, introduced Dean J. H. McLeod of the University's Department of Electrical Engineering, who welcomed delegates on behalf of the University and reviewed the role of technical societies in industry.

Afternoon session, with Professor William Snyder of the University of Washington presiding, opened with a talk by Norman Terry of Vancouver, past president of the Canadian Society of Cost Accountants, on *"The High Cost of Castings."* Mr. Terry advocated pricing castings on a cost-per-piece basis, rather than on costs-per-pound. This, he said, would permit accurate pricing of difficult castings.

L. D. Pridmore of International Molding Machine Co., LaGrange Park, Ill., speaking on *"Techniques of Core Blowing,"* outlined many time and labor saving tricks for the core room. He concluded with an actual demonstration of core blowing, using a machine set up in an adjacent building.

Winding up the Conference's technical program was a conducted tour of the University campus, including a lecture on the University's scale model of the Fraser River Delta Area Project.

Final official function of the Conference was the Post-Conference Party, held in the Sports Pavilion at Stanley Park Saturday night. Well over a hundred foundrymen and their wives enjoyed the warm hospitality of the host British Columbia Chapter. Overlooking English Bay, the Pavilion was an ideal site for an evening of dancing and relaxation.

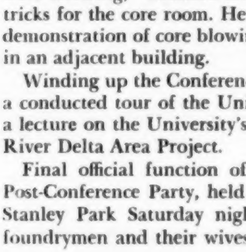
Vancouver foundryman Ray Mauro demonstrates core blowing to illustrate L. D. Pridmore's talk on "Techniques of Core Blowing," Saturday afternoon, Oct. 6.

The Northwest Regional Foundry Conference was extremely well-planned and carried out, the speakers were interesting and well-versed in their respective fields, and the social events provided a fitting climax to a successful Conference. Next year's Northwest Regional will have the A.F.S. Oregon Chapter as its host.

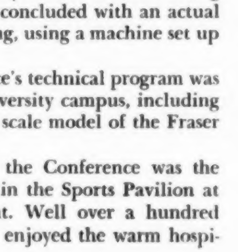
Success of the Northwest Regional was largely due to the work of the General Conference Committee, headed by Chairman William M. Armstrong of the University of British Columbia, assisted by James A. Dickson, Dickson Foundry Co., Vancouver; Alex Patterson, Terminal City Iron Works, Vancouver; Fred Young, A. E. Wilson Co., Seattle; M. O. Woodall, Rich Mfg. Co., Portland, Ore.; William Holeton, British Columbia Research Council, Vancouver.

James Dolanski, Griffin Wheel Co., Tacoma, Wash.; Lovick P. Young, A-1 Steel & Iron Co., Ltd., Vancouver; William Snyder, University of Washington; Charles Anderson, Eagle Brass Foundry, Seattle; Frank Godwin, Overseas Commodities Corp., Vancouver; and Herbert Heaton, Letson & Burke, Ltd., Vancouver.

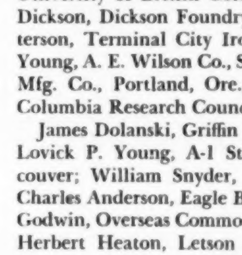
A. M. ONDREYCO



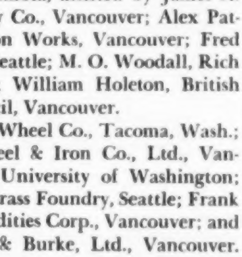
L. D. PRIDMORE



S. F. GERTSMAN



NORMAN TERRY



NEWS OF A.F.S. TECHNICAL COMMITTEES

A.F.S. Refractories Committee

PLANS for Refractories sessions at the 1952 International Foundry Congress were outlined at a meeting of the A.F.S. Refractories Committee September 28 at A.F.S. Headquarters, Chicago.

One session, proposed to be held jointly by the Committee and the Gray Iron Division, is tentatively programmed to include papers on *"Basic Refractories for the Cupola," "Fundamentals of Foundry Refractories," and "Foundry Ladle Refractories."*

Also suggested was a joint session with the Malleable Division which would include papers on refractories in duplexing operations and on batch melting in air furnaces.

A.F.S. Malleable Division Research Committee

MEETING OCTOBER 12 at the University of Wisconsin, the A.F.S. Malleable Division Research Committee heard a progress report on the A.F.S. Research Project there and decided upon further research to be undertaken.

Research report included discussion of data obtained on the hot tear testing machine, hot tears vs. carbon content at pouring temperatures ranging from 2700 F to 2900 F, effect of atmosphere on fluidity and hot tear strength and tendency toward mottling. Future program to be followed on this research, it was decided, will include:

Completion of tests at 2700 F and determination of effect when metal is melted under an atmosphere of nitrogen and water vapor.

Additional tests to be run melting metal under an atmosphere of carbon dioxide, and completed under argon.

Repeating of these atmosphere studies at 2900 F, using the same gases.

Running of heats in which metal will have approximately 0.10 per cent manganese deficiency, and others with manganese 0.10 per cent over the normal range, so as to study influence of manganese-sulphur ratio on hot tear behavior and fluidity.

Clyde A. Sanders Heads Sand Division

CLYDE A. SANDERS of American Colloid Co., Chicago, long active in technical committee work of the A.F.S. Sand Division, has been named Division chairman, replacing the late Dr. Heinrich Ries, who had headed the Division almost since its inception in the early 1920's.

Mr. Sanders has been active on virtually every committee of the Division, is a frequent contributor to AMERICAN FOUNDRYMAN on many sand topics, and has appeared at many A.F.S. chapter, regional and national meetings as a speaker.

A.F.S. Brass & Bronze Division Executive Committee

PRESENT STATUS of the Division's 1952 International Foundry Congress technical programs, as reported at a meeting of its Executive Committee October 17 in Chicago, includes these papers:

"Melting of Nickel," "Properties of Copper-Nickel Alloys Containing Chromium," "Radiography of Bronze Castings," "Effect of Additive Elements on Grain Size of Copper Base Alloys," "Effect of Mold Conditions on Deoxidation of Copper Castings," "Pressure Tightness of Bronze Castings," "Recovery of Bronze in the Foundry," and *"Freezing Ranges on Commercial Copper-Base Alloys."*

Shop Courses, it was thought, might well be jointly sponsored with the Sand Division's Sand Shop Course Committee, in two two-hour sessions. Suggested topics are *"Synthetic vs. Naturally Bonded Sand for Brass and Bronze"* and *"Shell Molding."*

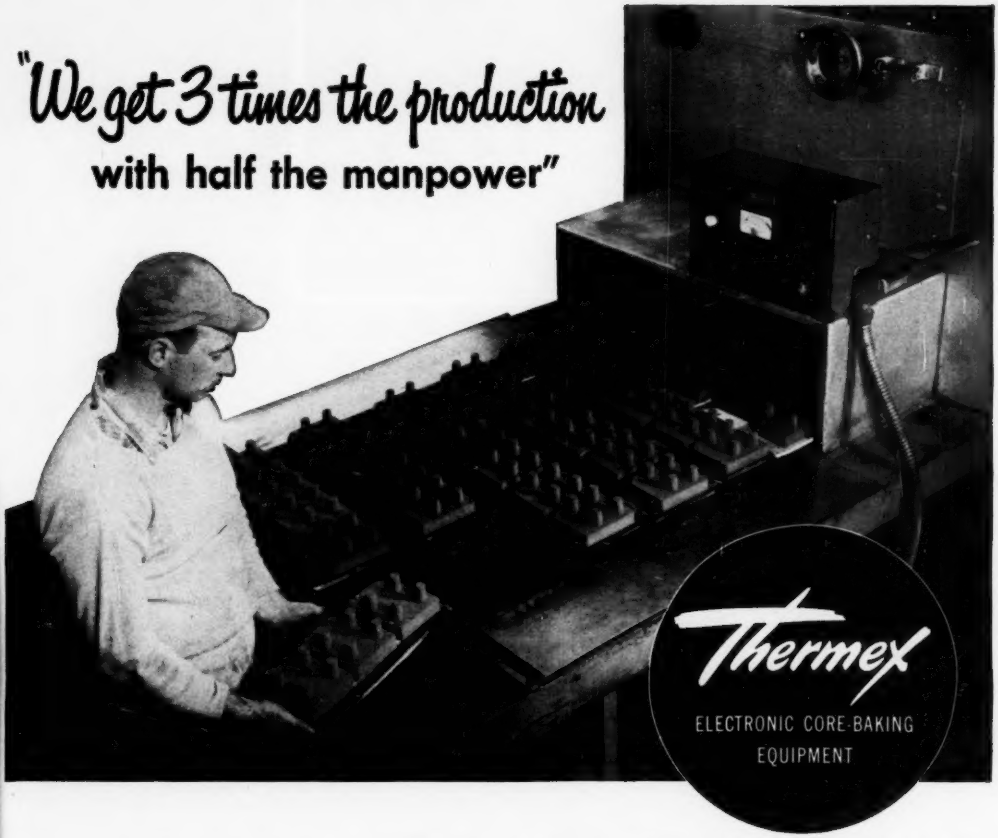
Attending were Chairman A. K. Higgins, Allis-Chalmers Mfg. Co., Milwaukee; Vice-Chairman Bernard N. Ames, New York Naval Shipyard; G. K. Eggleston, Barnes Mfg. Co., Mansfield, Ohio; R. B. Fischer, Ingersoll Rand Co., Philipsburg, N. J.; B. A. Miller, Baldwin-Lima-Hamilton Corp., Philadelphia; F. L. Riddell, H. Kramer & Co., Chicago; and A.F.S. Technical Director S. C. Massari.

A.F.S. Plant & Plant Equipment Committee

MOLDING MACHINES are contemplated as the subject of a Symposium to be

(Continued on Page 87)

Members of the A.F.S. Malleable Division's Research Committee shown with University of Wisconsin faculty members as they met October 12 at the University to discuss plans for the A.F.S. Research Project in operation there since last year. Seated, clockwise from lower left: W. D. McMillan, International Harvester Co., Chicago, Malleable Division chairman and Committee vice-chairman; P. F. Ulmer, Link-Belt Co., Indianapolis; Milton Tilley, National Malleable & Steel Castings Co., Cleveland; A.F.S. Technical Director S. C. Massari; Chairman Carl F. Joseph, Central Foundry Div., General Motors Corp., Saginaw, Mich.; Robert V. Osborne, Lakeside Malleable Castings Co., Racine, Wis.; W. A. Kennedy, Grinnel Co., Providence, R. I.; James H. Lansing, Malleable Founders' Society, Cleveland; and Richard Schneidewind, University of Michigan, Ann Arbor, Mich. Standing at rear are University of Wisconsin faculty members associated with the Malleable Research Project, left to right: Professors Philip C. Rosenthal and Richard W. Heine, A.F.S. Project Assistant Eugene Lange and Professors George J. Barker and Kurt E. Wendt.



Thermex
ELECTRONIC CORE-BAKING EQUIPMENT

FOUNDRY *Personalities*

Henry Sokol has been named general manager of the DoALL Detroit Co., exclusive Detroit area distributors of DoALL machine tool and industrial supplies. He has been with DoALL since 1947 in sales and service work and was formerly manager of the company's Grand Rapids, Mich., outlet. Succeeding Mr. Sokol at Grand Rapids is **Kurt G. Krebs,** who has been with the company for some time in sales and service work.

Harold W. Schwengel, sales manager of Modern Equipment Co., Port Washington, Wis., has been named vice-president and will continue as sales manager. During the last 12 years, Mr. Schwengel has served with the company in production engineering, sales engineering, as chief design engineer and as sales manager. Long an active member of the A.F.S. Wisconsin Chapter, Mr. Schwengel specializes in synchronization of charging and melting procedures with pour-off systems for foundries.

H. W. Schwengel

Samuel O. Sorenson, vice-president in charge of research for Archer-Daniels-Midland Co., was elected a member of the company's Board of Directors on October 9. First joining A-D-M as a chemist in 1923, Mr. Sorenson has served successively as chief chemist, technical director, and since 1947, vice-president in charge of research. Under his direction, the company has developed and improved such products as industrial cereals, fatty acids, fish oils, flours, paints, chemical specialties and foundry products.

Harold E. Simmons has joined Reda Pump Co., Bartlesville, Okla., as an engineer in its Furnace Division. A graduate of Massachusetts Institute of Technology, Mr. Simmons was metallurgist for Electron Corp., Littleton, Colo., for the last two years, and before that was with Manwick Malleable Co., Hillsgrove, R. I., and John Deere & Co., Moline, Ill.

Edward J. Roesch has been appointed superintendent of the Meadow Lands, Pa., plant of American Brake Shoe Co.'s Brake Shoe & Castings Division. Also promoted by the Division is **Thomas P. Wallace,** to be superintendent of its Buffalo plant. **Thomas Baldwin,** Mr. Roesch's predecessor at Meadow Lands, has retired but will continue as a consultant for several months.

Sven Vaule, consulting management engineer who temporarily discontinued practice in 1949 to fill in as works manager at Saco-Lowell Foundry Co.'s Biddeford, Me., plant, has resigned to resume his consulting practice. During his service with Saco-Lowell, Mr. Vaule was responsible for many advances made under the company's $5 million modernization program.

Sven Vaule

Howard J. Moore has been appointed plant engineer, **Russell Brant** assistant metallurgist and **John W. MacMillan** superintendent of Engineering Castings, Inc., Marshall, Mich. A graduate of Tri-State College in mechanical engineering in 1947, Mr. Moore has since been with the Kellogg Co., Battle Creek, Mich., as an engineer and draftsman. Mr. Brant, who will take over duties in the company's Quality Control and Technical departments, holds a B.S. in mechanical engineering from Michigan State College this June, and served with the Army in the Pacific in World War II. Mr. MacMillan is a graduate mechanical and industrial engineer of the University of Michigan and was formerly foundry engineer with Ingersoll-Rand Co., Painted Post, N. Y. He served as an officer in the Second Marine Division in the Pacific in the last war.

Donald F. Lane, who has been active in A.F.S. committee work for several years, has joined Ebasco Services, Inc., as industrial relations consultant. Mr. Lane is vice-chairman of the A.F.S. Apprentice Training Committee, and a member of the Educational Division's Program & Papers, Foreman Training, and Guide to A.F.S. Chapters on Educational Activities Committees.

Russell Lindersmith has been named to the staff of Wilson & Geo. Meyer & Co., newly appointed West Coast distributors for Empire coke, a product of DeBardeleben Coal Corp., Birmingham, Ala. Mr. Lindersmith will handle sales and distribution in southern California and will make his headquarters at Los Angeles.

Russell Lindersmith

Robert C. Becherer, since 1947 general manager of Link-Belt Co.'s Ewart plant, Indianapolis, and vice-president of the company since last March, was recently elected executive vice-president. Succeeding Mr. Becherer as general manager of the Ewart plant is **Richard E. Whinrey,** formerly assistant general manager there. Mr. Becherer joined Link-Belt in 1923 upon graduation from Purdue University in chemical engineering. Also a graduate of Purdue (mechanical engineering), Mr. Whinrey has been with Link-Belt since 1925 and was assistant general manager of the company's Dodge plant, Indianapolis, before joining the Ewart plant.

Lloyd R. Jackson has been named an assistant director of Battelle Memorial Institute, Columbus, Ohio, where he will handle research coordination. A specialist on engineering properties of metals, Mr. Jackson has been associated with Battelle research on fatigue, creep, plastic flow and structural analysis since 1935.

(Continued on Page 92)

ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

How Ladle Inoculants Reduce Chill . . . Produce High-Strength, Machinable Iron

One of the most significant developments in the field of cast iron metallurgy during recent years has been the widespread growth of the process of "inoculation" in producing quality metal to strict specifications. Inoculation has been defined as "a process in which an addition is made to molten cast iron for the purpose of altering or modifying the micro-structure of the iron and thereby improving the mechanical and physical properties to a degree not explainable on the basis of the change in composition."*

Various ladle addition alloys are used for inoculation of cast iron, but there is a wide range in the efficiency and potency of these materials. The 50 per cent and 75 per cent ferrosilicons are mild inoculants, but they are used as ladle additions principally as a means of adjusting the silicon content of cast iron. The 85 per cent and 90 per cent grades of ferrosilicon are much more effective inoculants. Inoculating power is further improved through the use of special inoculating alloys, such as silicon-manganese-zirconium ("SMZ" alloy) and calcium-silicon.

*Definition by H. W. Lownie, Jr.—A.F.S. Symposium on "Inoculation of Gray Cast Iron."

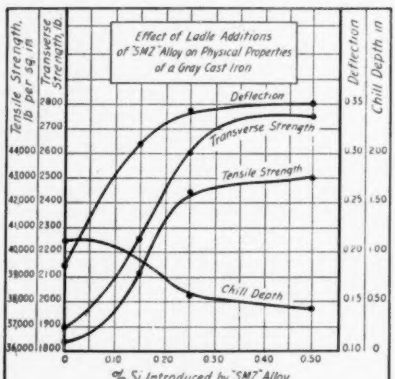
ELECTROMET produces a number of alloys for inoculation, each of which has specific applications. The graphitizing inoculants are:

"SMZ" Alloy	60-65% silicon 5-7% manganese 5-7% zirconium
Calcium-Silicon	30-33% calcium 60-65% silicon
90% Ferrosilicon	92-95% silicon
85% Ferrosilicon	83-88% silicon
Special Graphitizer	A mixture of ferrosilicon and graphite for special uses.
75% Ferrosilicon	73-78% silicon
50% Ferrosilicon	47-51% silicon

These inoculants are usually added to the molten iron as it leaves the cupola spout, or during transfer from one ladle to another.

"SMZ" Alloy—An Efficient Inoculant

The benefits of inoculation are obtained largely as the result of rigid control of the structure of the graphite phase of cast iron which has received this treatment. The results of inoculation on the properties of a typical cast iron are demonstrated by the accompanying illustrations showing the effect of adding various amounts of "SMZ" alloy.



Effects of Inoculation

The effects of graphitizing inoculants are: a drastic decrease in the chilling tendency of a given iron, a mild decrease in Brinell hardness, lowering of the section sensitivity of the metal, a definite increase in tensile strength, and an increase in transverse strength and deflection. These benefits are usually accompanied by improved fluidity, better castability, and improved resistance to wear.

Fig. 1—These curves show how additions of "SMZ" alloy reduce depth of chill and improve mechanical properties when added to a series of irons selected to give the following final analysis: 3.10 total carbon, 0.60 combined carbon, 1.80 silicon, and 0.50 manganese.

Fig. 2—These chill blocks show how progressive additions of "SMZ" alloy reduce the depth of chill.

New Stabilizing Inoculant

For the production of cast iron, ELECTROMET developed recently a special low-carbon foundry ferrochrome. This silicon-chromium alloy is so balanced in composition that it increases the strength and hardness of gray iron, without increasing chill. The new alloy has a nominal analysis of 30 per cent silicon and 50 per cent chromium. It has excellent solubility in iron, and the inoculating effect of the silicon content makes it possible to add up to 1 per cent chromium to gray iron as a ladle addition, with no appreciable increase in chill. Castings treated with the new alloy have an excellent balance between machinability and good resistance to wear.

Booklets Available

Further information about ladle inoculants is given in the booklets, "SMZ Alloy and Its Uses as a Ladle Addition to Cast Iron" and "Silicon-Chromium Alloy in Complicated Iron Castings." You may obtain copies, free of charge, by writing or phoning to the address given above or to the nearest ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

New AFS MEMBERS

NEW COMPANY MEMBERS

Bonham Foundry Co., Bonham, Texas, John S. Dickey, Partner (Texas Chapter).

Calmo Engineering Co., Los Angeles, Chas. E. Findlay, Pres. & Gen. Mgr., (Southern California Chapter) Conversion from Personal.

Capital Products, Inc., Long Island City, N. Y., Edward L. Blessington, Pres. (Metropolitan Chapter).

Midwest Foundry Co., Coldwater, Mich., John E. Wolf, Mgr., (Central Michigan Chapter).

CHAPTERS

BIRMINGHAM DISTRICT CHAPTER

Joseph R. McLaughlin, Ind. Sales & Engrg. Carborundum Co.

CANTON DISTRICT CHAPTER

Joseph A. Benner, Supv., United Engineering & Fdy. Co.

John Henrich, Sales, F. A. Basler.

Gerald N. Moorhead, Met., United Engineering & Foundry Co.

Edward P. Sandbach, Research Met., United Engineering & Foundry Co.

Clyde I. Thompson, Refractories Engr., Robinson Clay Product Co.

Chester R. Wingert, United Engineering & Foundry Co.

CENTRAL ILLINOIS CHAPTER

Ray F. Heiden, Treas., Galva Foundry Co.

CENTRAL INDIANA CHAPTER

Donald E. Alvis, Night Supt., Golden Foundry Co.

William M. Button, Electric Steel Castings Co.

Edward J. Dunn, Sand Tech., Sonith Industries, Inc.

Henry L. Flynn, Sales Repr., Laclede Christy Co.

Jack Holt, Gen. Fmn., Core Dept., National Malleable & Steel Castings Co .

Robert H. Mitchell, Partner, L. W. & W. K. Mitchell Co.

Albert M. Prewitt, Sand Tech., Golden Foundry Co.

Charles E. Scalf, Supv. Fdy. Scheduling, National Malleable & Steel Castings Co.

Paul J. Simmonds, Asst. to Plant Engr., International Harvester Co.

Arthur E. Spaulding, Student, International Harvester Co.

Stephens S. Taylor, Electric Steel Castings Co.

Edward H. Wilhelms, Electric Steel Castings Co.

Paul K. Wince, Fdy. Met., Sonith Industries, Inc.

CENTRAL MICHIGAN CHAPTER

Warren R. Baker, Service Engr., Albion Malleable Iron Co.

Jack Hartnell, Cupola Tender, Midwest Foundry Co.

Charles James Kozak, Met., Albion Malleable Iron Co.

John E. Kruse, Appr., Albion Malleable Iron Co.

John W. Mac Millan, Supt., Engineering Castings, Inc.

Mike Masternak, Jr., Gen. Fmn. of the Fdy., Albion Malleable Iron Co.

Donald M. Murray, Chief Chemist, Albion Malleable Iron Co.

John R. Steurer, Asst. Prod. Mgr., Albion Malleable Iron Co.

E. D. Williams, Equipment Design Engr., Albion Malleable Iron Co.

Midwest Foundry Co., Coldwater, Mich., John E. Wolf, Mgr.

CENTRAL NEW YORK CHAPTER

Charles S. Bailey, Night Mgr., Oberdorfer Foundries, Inc.

Earl F. Cromp, Fmn., Aluminum Melting, Oberdorfer Foundries, Inc.

Frank DePellio, Coreroom Fmn. & Asst. Supt., Utica Steam Engine & Boiler Wks.

Carl Foriero, Fdy. Fmn., Oberdorfer Foundries, Inc.

John A. Feola
Crouse-Hinds Co.
Syracuse, N. Y.
Membership Chairman
Central New York Chapter

Stanley Gladis, Fdy. Supt., Oberdorfer Foundries, Inc.

Howard Morris Kellam, Cleaning Fmn., Sweets Foundry, Inc.

Frank W. Kidney, Mgr., Permold Div., Oberdorfer Foundries, Inc.

Robert G. King, Fdy. Tech., Oberdorfer Foundries, Inc.

Charles Lay, Owner, Eagle Bronze & Aluminum Co.

Ralph J. Marquis, Pres., Thomas Foundry, Inc.

William A. Papenfus, Fmn., Oberdorfer Foundries, Inc.

John Rothrock, Appr. Molder, Sweets Foundry, Inc.

John J. Schairer, Night Coreroom Supt., Oberdorfer Foundries, Inc.

Daniel I. Speach, Fmn., Oberdorfer Foundries, Inc.

William W. Thomas, Engr., Straight Line Fdy. & Mach. Corp.

Orson L. Walter, Prod. Mgr., Oberdorfer Foundries, Inc.

Frank L. Wenzel, Fdy. Fmn., Straight Line Fdy. & Mach. Corp.

Robert C. Ward, Quality Director, Oberdorfer Foundries, Inc.

Sereno Wilson, Fmn., Oberdorfer Foundries, Inc.

Frank L. Winne, Jr., Quality Control Statistician, Oberdorfer Foundries, Inc.

CENTRAL OHIO CHAPTER

Henry L. Martin, Research Engr., Battelle Memorial Institute.

CHESAPEAKE CHAPTER

Philip A. Newhart, Fdy. Supt., Koppers Co., Metal Products Div.

Edgar F. Stump, Asst. Fdy. Supt., Koppers Co., Metal Products Div.

CHICAGO CHAPTER

Halsay R. Bilter, Fdy. Lab. Tech., International Harvester Co.

Roland D. Block, Asst. Plant Met., National Malleable & Steel Castings Co.

Leo F. Dennie, Tech. Service, Black Products Co.

Daniel R. Jones, Salesman, Illinois Clay Products Co.

Arthur W. Koepke, Gen. Fdy. Fmn., Pyle-National Co.

Wm. R. Martindale, Expediter & Trouble Shooter, Howard Foundry Co., Mag. Div.

David Matter, Fdy. Lab. Tech., International Harvester Co.

R. Persiani, Fdy. Fmn., Amsco Div., American Brake Shoe Co.

CINCINNATI DISTRICT CHAPTER

Gerald L. Brunsman, Fdy. Fmn., Lunkenheimer Co.

William C. Kircher, Fdy. Supt., Lunkenheimer Co.

George Lowry, Fdy. Supt., Master Electric Co.

LeRoy J. Volz, Supv., Cincinnati Milling Machine Co.

EASTERN NEW YORK CHAPTER

William G. Fabofsky, Weighmaster, General Electric Co.

Edgar F. Stresino, Instructor, Rensselaer Polytechnic Institute.

METROPOLITAN CHAPTER

Capital Products, Inc., Long Island City, N. Y., Edward L. Blessington, Pres.

J. Bruce Ferguson, Engr., International Nickel Co., Inc.

William F. Kirk, Research Asst., New York University, Research Div.

Michael J. Micik, Head of Standards, American Brake Shoe Co.

James W. Stuart, Sales Engr., Osborn Manufacturing Co.

MEXICO CITY CHAPTER

Robert C. Barrera, Mech. Elec. Supt., American Smelting & Refining Co.

Guillermo Revilla, Owner & Mgr., Metales, S. de R.L.

MICHIANA CHAPTER

Charles E. Caldwell, Gen. Fmn., Oliver Corp.

Robert Hoffman, Coreroom Fmn., Dodge Mfg. Corp.

Howard Konkle, Fdy. Fmn., Dodge Mfg. Corp.

NORTHEASTERN OHIO CHAPTER

John G. Balsay, Fmn., Superior Fdy. Inc.

James Coleman, Fmn., Superior Foundry.

Steve Demko, Plant Engr., Superior Foundry, Inc.

Steve Kallas, Draftsman, Osborn Mfg. Co.

Leonard Kasco, Fmn., Superior Foundry, Inc.
William E. Hampton, Fmn., Superior Foundry, Inc.
Stanley Hemel, Fmn., Superior Foundry, Inc.
Stephen Liptak, Fmn., Superior Foundry, Inc.
George Montowski, Fmn., Superior Foundry, Inc.
B. Nowak, Fmn., Superior Foundry, Inc.
Edward Petrick, Fmn., Superior Foundry, Inc.
Howard Schaffer, Fmn., Superior Foundry, Inc.

NO. ILLINOIS-SO. WISCONSIN
Laner Merlyn Munck, Molding Fmn., Fairbanks-Morse.

N. W. PENNSYLVANIA CHAPTER
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Fredolph B. Johnson, Molder, Worthington Pump & Mach. Corp.
Lynn McDougall, Cooper-Bessemer Corp.
Richard T. Wilson, Fmn., Worthington Pump & Mach. Corp.

PHILADELPHIA CHAPTER
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Robert E. Kruse, Secretary, Kruse Pattern Works.
John P. Laux, Jr., Fdy. Supt., Pusey & Jones Corp.

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Burdette Jones, Fmn. Sand Control, John Deere Tractor Works.
O. J. Popelier, Coreroom Fmn., John Deere Spreader Works.
John G. Smillie, Lab. Tech., John Deere & Co.
Herbert Stach, Pouring Fmn., John Deere Spreader Works.
Lewis E. Sutton, Supv., John Deere & Co., Union Malleable Iron Works.

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Edward F. Crimmins, Gen. Fdy. & Mfg. Co.
Richard Harrison, Gen. Fmn., Saginaw Malleable Iron Co.
Arthur J. Karam, Met., Saginaw Malleable Iron Co.
Roland J. Kwaiser, Gen. Fmn., Saginaw Malleable Iron Co.

Collins L. Carter
Albion Malleable Iron Co.
Albion, Mich.
Membership Chairman
Central Michigan Chapter

Louis B. Lamb, Jr., Appr., Chevrolet Grey Iron Fdy.
John Olszewski, Fmn., Saginaw Malleable Iron Co.
Edlinger Thomas, Fmn., Saginaw Malleable Iron Co.
Glenn Stuart, Cost Clerk, Bostic Foundry Co.

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William V. Peterson, Chemist, M. A. Bell Co.
Lloyd M. Rose, Service Engr., M. A. Bell Co.

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Tom H. Evans, Partner, Atlas Testing Laboratories.
Bruce Farroe, Salesman, Snyder Foundry Supply Co.
John B. La Bosky, Research Met., U. S. Naval Ordnance Test Station.
Frank L. Rathswohl, Fy. Fmn., Compton Foundry.
K. F. Sheckler, Chief Engr., Calmo Engineering Co.

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Bonham Foundry Co., Bonham, Texas, John S. Dickey, Partner.
Frank A. Fournier, Sr., Partner, F. & J. Pattern Works.
Glenn Galloway, Fdy. Engr., Lufkin Foundry & Machine Co.
E. W. Grubbs, Owner, Grubbs Foundry.
William Keller, San Antonio, Texas.
Raymond B. Margozewitz, Vice-Pres., AA Brass & Bronze & Aluminum Fdy. Co.

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Gerald J. Grott, Research Met., Unitcast Corp.
Milton Hansen, Fmn., Molding, E. W. Bliss Co.
F. W. Schuster, Molding Fmn., E. W. Bliss Co.
Franklin Van Karsen, Pres., Atlas Pattern.

TWIN CITY CHAPTER
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Jack Meckel, Sales, Core Oil, Archer-Daniels-Midland Co.

WASHINGTON CHAPTER
James H. Chapman, Casting Inspector, Atlas Foundry & Machine Co.
Jack E. McDaniel, Appr., Eagle Foundry Co.
Leon Morel, Jr., Supt., Morel Foundry Corp.
Frank C. Rogers, Vice-Pres., N. & S. Foundry Co.

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Leon Fewlass, Cadillac Malleable Iron Co.
Stanley Jabaay, Salesman, Jos. Monahan Co.
Stanley P. Ozgowicz, Fdy. Supt., Lakey Foundry & Machine Co.
Harlan O. Page, Jr., Cadillac Malleable Iron Co.

WESTERN NEW YORK CHAPTER
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Donald S. Jaquith, District Sales Engr., Pangborn Corp.
John D. Maxwell, Vice-Pres., Dussault Foundry Corp.
J. K. Munhall, Repr., Detroit Electric Furnace Div., Kuhlman Electric Co.

Lee Edwards
A. P. Green Fire Brick Co.
Indianapolis, Ind.
Membership Chairman
Central Indiana Chapter

WISCONSIN CHAPTER
Ralph Calvano, Westover Engineers.
Herbert E. Groth, Patternmaker, Grede Foundries, Inc.
William Earl Joanis, Trainee, Grede Foundries, Inc.
James V. Mueller, Supv. Pattern Storage, Grede Foundries, Inc.
Fred B. Stephens, Fmn., Cleaning, Grede Foundries, Inc.
Earl Zittel, Molding Fmn., Grede Foundries, Inc.

STUDENT CHAPTERS

M. I. T.
Ronald F. Harris
Clarence F. Lautzenheiser
Frank J. O'Neil
Robert F. Packard
Paul L. Przybylek

MICHIGAN STATE COLLEGE
Elmer Louis Le Bay
Wendell D. McGrath
Lloyd Wm. Shelder
Claridon Jay Thomas

MISSOURI SCHOOL OF MINES
Sidney J. Cole
Donald Drewel
Dwight F. Hagemeier
Herbert F. Ogle

NORTHWESTERN UNIVERSITY
Glenn Seaton Shelley

UNIVERSITY OF ALABAMA
Donald Brown
Mark C. Gregoire
Alfred N. Good
Frank Muhaw

UNIVERSITY OF ILLINOIS
Milton A. Diller

INTERNATIONAL

Denmark
Ove Hoff, Prof., Lab. of Fdy. Tech., Royal Institute of Tech., Ostervoldgade 10, Copenhagen, Denmark.

England
Reginald Lee, Tech. Mgr., Brightside Fdy. & Engrg. Co., Ltd., Sheffield, England.

Germany
George August Hans Jungbluth, Prof., Technical University, Karlsruhe/Baden, Kaiserstr 12, Germany.

Japan
Hiromu Tanimura, Doctor of Engr., Professor of Kyushu University, Met. Section, Engr. Dept., Hakozaki-Machi, Fukuoka City, Japan.

Recently photographed with faculty members of the Missouri School of Mines are these FEF scholarship students for 1951-52. Front row, left to right: Chairman A. W. Schlechten, Department of Metallurgical Engineering; Dean Curtis L. Wilson; Jack H. Thompson; Anthony J. Selvaggi; Albin B. Charneski; and D. S. Eppelsheimer, professor of Metallurgical Engineering and Student Chapter Faculty Advisor. Second Row: Students Don L. Mathis, Jack M. Wheeler, Alan B. Burgess, Jack H. Humphrey and William D. Bradley. Third Row: Ralph L. Hollocher, Leland D. Beverage, Norbert F. Neumann and Joseph L. March.

CHAPTER ACTIVITIES NEWS

Central New York

Ralph J. Denton
Publicity Chairman

FIRST MEETING of the season was a howling success. Utica foundrymen were hosts to the meeting September 14 at Twin Ponds Country Club, New York Mills.

The following foundries in Utica and vicinity turned out in full strength: Utica Radiator Corp., Chicago Pneumatic Tool Corp., International Heater, Utica Steam Engine and Boiler and Oriskany Malleable Iron Co. Speaker was A. S. Coulter, Archer-Daniels-Midland Co., Foundry Products Div., who showed a movie entitled *"The A-D-M of Cores."* This was the second showing of this picture and the Chapter recommends it highly.

The film was taken in the Studebaker foundries and the laboratory of Archer-Daniels-Midland Co. The speaker conducted a question-and-answer period following the movie.

Chesapeake

Joe Danko, Jr.
Arlington Bronze & Aluminum Corp.
Chapter Reporter

CHESAPEAKE CHAPTER "took to the mountains" for its first meeting of the season September 21 as the foundries of Chambersburg, Pa., played hosts to a joint meeting of the Chapter and the Conestoga Foundrymen's Society.

Plant visits were made to T. B. Wood Sons Co.'s foundry—a modern example of gray iron mass production, and Chambersburg Engineering Co.'s foundry, where heavy iron work is cast in cement molds.

After a fine dinner at Piney Mountain Inn, near Chambersburg, Chairman Allen Kittrell, Leach Pattern Shop, introduced A.F.S. National Secretary-Treasurer Wm. W. Maloney, who briefed the group on the 1952 A.F.S. International Foundry Congress & Show, to be held May 1 through

Ontario Chapter foundrymen enjoyed themselves hugely as member Rolph Barnes again played host to the Chapter's Annual Picnic at his estate near Watertown, Ont. Photo by Jack Richardson, Wm. R. Barnes Co., Ltd.

Caught in a happy mood by Chapter Photographer Fred Brosmer, Caterpillar Tractor Co., at Central Illinois Chapter's October meeting were, from left: George Rockwell, Caterpillar Tractor Co.; A.F.S. National Director Fred G. Sefing, International Nickel Co., New York, speaker of the evening, and Ralph Brower, also of Caterpillar Tractor Company, Peoria.

Some 325 foundrymen and their guests were present at Tennessee Chapter's Annual Picnic September 22 at Signal Mountain Country Club to enjoy a day of sports, loafin', entertainment and a sho 'nuff Southern barbecue.

Big smiles were caught by Chapter Photographer Jack Eggleston, Albion Malleable Iron Co., as he snapped (from left) Chapter Director Jack Secor, Hill & Griffith Co.; Ralph Brooks, Brooks Furnace Co.; and W. W. Stout of Marshall Foundry at Central Michigan Chapter's October 17 meet.

7 in Atlantic City. "Every Foundry in '52" is the Convention slogan, he said. Mr. Maloney was followed on the program by A.F.S. National Vice-President I. R. Wagner, who stressed the need for the industry sponsored Safety & Hygiene & Air Pollution Program being undertaken by the Society.

Main speaker was Douglas Galloway, Chambersburg Engineering Co., who discussed *"The Why and How of Cement Molding,"* in which he outlined such advantages as greater mold accuracy, reduced shrinkage trouble and less cleaning problems. At Chambersburg Engineering, he said, silica sand is mixed with water and about 11 per cent cement. This is used for facing sand, and sea coal is added for heavy-sectioned castings.

The mold surface, he continued, is always washed with a coating of coke base blacking and thoroughly dried. No artificial drying is required for either cores or molds because of the cement base.

In conclusion, Mr. Galloway said that cement molding is not practical for a mass production shop producing smaller castings because of drying time required.

Southern California

Alfred A. Grant
Grant & Company
Publicity Chairman

SECOND MEETING of the season, held October 12 at the Rodger Young Auditorium, Los Angeles, was attended by 112 foundrymen.

Principal speaker was R. A. Witschey, A. P. Green Fire Brick Co., whose subject was *"Foundry Refractories."* He discussed the general application of refractories in cupolas and electric and reverberatory types of melting operations. Characteristics and uses of four main types of bricks were also covered. These include acid, basic, neutral and silicon carbide types.

Mr. Witschey also stressed the importance to all foundries of proper care of refractories. Records, he said, should be kept on all refractory purchases as to their useful life and these should be compared with each new purchase of refractories.

The Membership Committee announced the names of four new members: Finley W. Edmonson, Los Angeles; Thomas R. Bradley, Spring Valley; Alfred Hamm, National Supply Co., Torrance; and Walter R. Lawson, National Supply Co.

Central Michigan

Richard Dobbins
Albion Malleable Iron Co.
Chapter Reporter

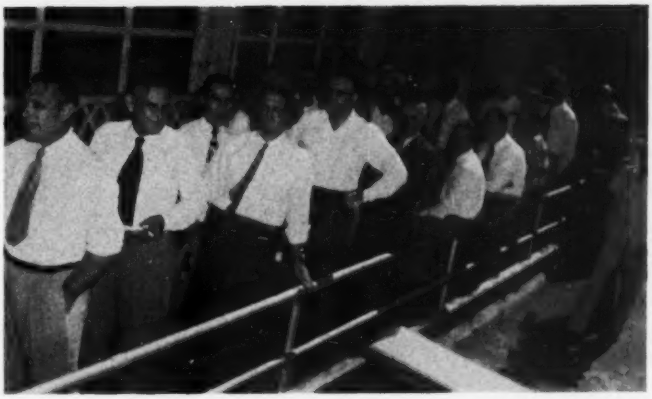
HART HOTEL, Battle Creek, was the scene October 17 of the Chapter's monthly dinner meeting, designated as "Management Night." Special efforts

were made to interest all management personnel, whether engaged in technical foundry work or not. An estimated 100 members and guests were on hand to enjoy the meal and entertainment.

Chapter Chairman, Thomas Lloyd, Albion Malleable Iron Co., opened the meeting with a few remarks regarding activities of the Chapter during the coming months. A short report of progress made in installing foundry classes at Battle Creek Vocational School, was given by Mr. Lloyd.

At this point Mr. Lloyd turned the meeting over to Lachlan Currie of Gale Manufacturing Co., Albion, who acted as technical chairman for the meeting.

Speaker of the evening was Frederick Wickert, professor of Psychology at Michigan State College, who discussed *"Selection of Supervisory Personnel."* The presentation was followed by a short question session.



Queuing up for a delicious barbecued chicken dinner were these hungry Birmingham District Chapter foundrymen at their Annual Picnic, Sept. 15.

Comradely group photographed during Canton District Chapter's October 4 meeting included, left to right: Frederick Fuller and Speaker Bruce L. Simpson, National Engineering Co., Chicago; Edward H. Taylor, Myers Pump Co., Canton; A. O. Prentice, Stark Foundry Co., Canton; and Chapter Chairman C. B. Williams, Massillon Steel Castings Co., Massillon, Ohio.

Northwestern Pennsylvania

Roy A. Loder
Erie Malleable Iron Co.
Chapter Reporter

First meeting of the season, held September 24 in the Moose Club, Erie, and attended by 125 members, opened with a business meeting.

Following this, Clyde A. Sanders, American Colloid Co., Chicago, chairman of the A.F.S. Sand Division, presented the results of some new experiments in *"The Effect of Sand on Metal Shrinkage."*

Mr. Sanders pointed out use of the correct amounts and types of clays and sea coal and the right amount of water will minimize shrinkage. Mr. Sanders also clearly demonstrated definite relationships between sand mixes and shrinkage. Good sand control, he said, can increase casting yield measurably.

Chapter Chairman Douglas C. James announced launching of a 1951-52

Good food, horseshoes and golf were feature attractions at Central Indiana Chapter's Annual Picnic, held September 15. Engaged in the usual heated argument over whose horseshoe is the closest are Fred Boling, left, and Wilburn McManimie, both of Gratland Foundry, Terre Haute. Holing out on the ninth are, from left, John Thomas, Herbert Hoover, Howard Walls and Chester Juday, Perfect Circle Corp.

Getting set for a good meal at Wisconsin Chapter's September meeting were, left to right: O. J. Myers, Foundry Products Div., Archer-Daniels-Midland Co., Minneapolis, evening's speaker; R. J. Anderson, Belle City Malleable Iron Co., Racine; and Chapter President George E. Tisdale, Zenith Foundry Co. Photo courtesy W. V. Napp, Delta Oil Products.

chapter membership drive for 62 new members to bring total chapter membership to 200. Seven new members from Worthington Pump Co. and Cascade Foundry were introduced.

Richard Strong of Griswold Manufacturing Co., Erie, was named chapter Entertainment Committee chairman, replacing Courtney Wilcox, Cascade Foundry.

Eastern Canada
A. E. Cartwright
Crane, Ltd.
Chapter Reporter

NEAR-CAPACITY audience of 150 attended the chapter's opening technical meeting on October 12 at the Mount Royal Hotel.

Feature of the meeting was a showing of the film, *"Mechanization in Molding,"* narrated both in person and on the screen by C. V. Nass, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago.

The film showed varied types of mechanization in several modern foundries, including ingeniously contrived production units for automatic flask, jacket, mold weight and bottom board manipulation that have eliminated much heavy labor and human variables from these processes.

Chapter membership was augmented by introduction of 28 new members at the meeting—a gratifying start for the season.

Northern California
John Bermingham
E. F. Houghton & Co.
Chapter Reporter

FIRST FALL MEETING drew the largest crowd of foundrymen ever to attend an opening chapter meeting. Featured speaker at the meeting, held September 17 at the Hotel Shattuck, Berkeley, was Warner B. Bishop, Foundry Products Div., Archer-Daniels-Midland Co., Cleveland, who discussed *"Foundry Core Binders—Their Characteristics and Uses,"* and supplemented his talk with the film *"The A-D-M of Cores."*

Mr. Bishop stressed importance of a proper ratio of sand, moisture, cereal and oil so that the mixture has sufficient green bond to meet requirements of the job at hand. The baking temperature and time cycle is equally important, he said.

A complete research program, properly controlled by foundry personnel, was suggested in order to arrive at suitable core sand mixtures so that uniform results can be obtained. Such a program would permit thorough analysis of core sand received from the supplier and proper adjustment of sand, water and oil ratio, a move in the right direction to eliminate questionable results in the core room, he concluded.

Texas

Some 56 foundrymen attended the September 28 meeting at the Menger Hotel, San Antonio, to view the Malleable Founders' Society film, *"This Moving World,"* upon the occasion of the American malleable foundry industry's 125th anniversary.

Featured speaker for the event was Col. Cal C. Chambers, president of the Malleable Founders' Society and head of Texas Foundries, Inc., Lufkin.

Tennessee

TENNESSEEANS enjoyed an old time Alabama barbecue on September 22 when approximately 325 foundrymen met at Signal Mountain Golf and Country Club for the Chapter's Annual Picnic and Barbecue.

Those who have never tasted an old time Alabama barbecue have missed something. The barbecue consists of beef, pork and lamb, and is tops in culinary art. Chiefly responsible for the barbecue was T. H. Johnson, Somerville Iron Works, Chattanooga, who claims the recipe has been handed down from generation to generation of his family and is 110 years old.

The secret, he says, is slow cooking on a sassafras and hickory wood fire, plus such ingredients as red pepper, black pepper, cinnamon, ginger, vinegar, butter, sugar, salt and oil of sassafras. Time required in barbecuing is about 40 hours.

The actual barbecuing began on

(Continued on Page 76)

Caught by Chapter Reporter-Photographer Norman E. Hall, Electric Steel Foundry Co., at Oregon Chapter's September 19 meeting were, left to right: Vice-Chairman William M. Halverson, Electric Steel Foundry Co.; Speaker Warner B. Bishop, Foundry Products Div., Archer-Daniels-Midland Co., Cleveland; Chairman E. J. Hyche and M. O. Woodall, Rich Mfg. Co.

CHAPTER ACTIVITIES

(Continued from Page 74)

Friday at the Somerville Iron Works, continuing through Saturday morning and early afternoon with the aid of hastily erected shelters against a torrential rain. Just before eating time it was transported from the Iron Works to Signal Mountain Country Club, where hungry foundrymen did it full justice.

Maitre d'Barbecue at Tennessee Chapter's Annual Picnic September 22 at Signal Mountain Country Club was T. A. Johnson of Somerville Iron Works (right), who was assisted by Fred McGee of Fanner Manufacturing Company.

Tri-State

J. G. Winget
Reda Pump Co.
Publicity Chairman

First meeting of the 1951-52 season, held at the Alvin Hotel, Tulsa, Okla., September 14, had as its speaker William H. Demmler of Harbison-Walker Refractories Co., who discussed "Latest Developments in Foundry Refractory Practice." Of particular interest in the several subjects covered by Mr. Demmler were methods of constructing electric furnace roofs, using standard shapes and ram-up refractories.

Mr. Demmler also discussed the basic cupola at some length, covering the subject thoroughly from refractories to results.

Central New York

J. Francis Dobbs
New York Air Brake Co.
Chapter Reporter

Designated *"Southern Tier Night,"* the October 12 meeting was exceedingly well supported. Chairman William D. Dunn of the Oberdorfer Foundries, Inc., Syracuse, presided and 24 new members were presented.

Lyle L. Clark Buick Division, General Motors Corporation, spoke on

"Cupola Operation." The subject was very well presented and illustrated with slides. Mr. Clark covered various foundry operations at Buick which are outstanding and original.

The subject of smoke abatement, particularly, was of timely interest to many. Melting iron by the most economical methods was of considerable interest to all foundrymen, who are faced today with inferior materials due to restrictions and limited supplies on an inflated market.

Upon completion of Mr. Clark's presentation, a discussion of individual problems was held by the speaker, who drew from his many experiences to help on current problems.

Talking over foundry problems at Central New York Chapter's September 14 meeting are, left, L. D. Wright, U. S. Radiator Co., Geneva, N. Y., A.F.S. National Director, and Speaker A. S. Coulter of Archer-Daniels-Midland Co.'s Foundry Products Division. Photograph courtesy of Ralph J. Denton of R. J. Denton Co., Syracuse.

Twin City

J. D. Johnson
Archer-Daniels-Midland Co.
Chapter Reporter

JOINT MEETING of the Chapter with the Twin Cities Foremen's Club heard Ralph L. Lee, General Motors Corp., Detroit, speak on *"Boss-to-Boss On the Job."*

Nearly 200 members heard Mr. Lee's excellent presentation of the human relations problem in industry, in which he stated that people do things because they feel like doing them and not because they think they are the right things to do.

Chicago

Dean Van Order
Burnside Steel Foundry Co.
Chapter Reporter

FIRST MEETING, held at the Chicago Bar Association, was attended by close to 150 members and guests. New Chair-

man Walter Moore, Burnside Steel Foundry Co., and Vice-Chairman John Owen, Harbison-Walker Refractories Co., welcomed members and discussed some 1951-52 meeting programs.

Speaker of the evening was the Honorable Warren L. Wood, Speaker of the 67th General Assembly of the

Inner workings of government were explained to members of the Chicago Chapter at their first 1951-52 meeting by the Hon. Warren L. Wood, speaker of the 17th General Assembly, Illinois House of Representatives. Photo: Dean Van Order, Burnside Steel Fdy. Co.

Chapter Chairman Walter Moore, Burnside Steel Foundry Co., Chicago, opens Chicago Chapter's first meeting of the new season. Photograph courtesy Dean Van Order, Burnside Steel Foundry Co.

House of Representatives, State of Illinois. Mr. Wood approached the political picture with the down-to-earth viewpoint of a small town citizen.

Mr. Wood has been in Illinois politics for over 18 years and during this time has had an opportunity to observe many politicians and their handling of the public's problems. Most of the government officials are honest,

in Mr. Wood's opinion, and will work for the people if given a chance.

Organized minorities are an important factor in the establishment of good legislation and may do a lot towards checking the drift in our government to unnecessary controls and unnecessary taxation.

If representatives of these organized groups would contact important people in office and convince them of the sincerity of good legislation, much could be done to bring the government back along the lines upon which our constitution was founded some 175 years ago, he concluded.

Metropolitan

William T. Bourke
American Brake Shoe Co.
Publicity Chairman

First meeting of the 1951-52 season, held October 1 at the Essex House, Newark, N. J., was attended by 130 members and guests.

Speaker was William M. Ball, Jr., R. Lavin & Sons, Inc., Chicago. Technical Chairman was Andrew E. St. John, Barth Smelting Corp.

Metropolitan Chapter's October 1 speaker, William M. Ball, Jr., R. Lavin & Sons, Inc., Chicago, right, assisted by Technical Chairman Andrew E. St. John of Barth Smelting Corp., answers questions from the floor on the fundamentals of foundry practice. Photograph courtesy of Robert J. Ely, American Brake Shoe Co.

Mr. Ball's subject was *"Essentials Required to Make Good Castings,"* in which he described the importance of the foundry in modern living.

Appealing to the practical foundryman, the speaker forcefully emphasized fundamentals of good foundry practice, or what he referred to as the "Three M's"—Machines, Materials, and Men. Of these three, he believes, handling of men deserves attention.

Preventing defective castings, he

(Continued on Page 81)

NEW . . Foundry . Products

For additional information on New Products, use postcard at bottom of this page.

Aluminum Alloy

1—Almag 35 is high-purity virgin aluminum alloy of the aluminum-magnesium type possessing a high and stable combination of strength, shock resistance and ductility. Features: 38,000 to 44,000 psi tensile strength as-cast; 10-15 per cent elongation in 2 in. as-cast; great stable shock resistance; four times milling speed of 108, and 16 to 18 times that of gray iron and malleable; superior corrosion resistance, dimensional stability as-cast; no heat treatment required; and constant properties for life of casting. *William F. Jobbins, Inc.*

Barrel-Finishing Compound

2—Blue Magic Compound No. 1, a highly concentrated paste for use in barrel finishing brass, bronze, copper, gold and silver castings, and machined and drawn parts, is claimed to yield uniform metallic colors and finishes in an extremely short time cycle. Compound will finish with or without media, and with selected non-ferrous media for roughing, deburring, cleaning and finishing in a single operation. *Blue Magic Chemical Specialties Co.*

Friction Saw Band

3—Band specifically designed for friction sawing features permanently anchored and locked saw band teeth. Metallurgical characteristics permit maximum flexation, resulting in long, uninterrupted production sawing. Friction sawing involves saw velocities up to 15,000 fpm, bringing metals being cut to softening point through friction created between cutting edge of blade and work. Manufacturer claims unit production cost is but a fraction of that with other sawing methods. Saw comes in ½, ¾ and 1 in. widths. *DoALL Co.*

Furnace Compound

4—Petrocol A-111 is a fuel system treatment compound for maintenance of predetermined fuel delivery in industrial furnaces. Petrocol A-11 provides constant Orsat measurements of oxidizing and reducing gases in furnaces where variations are traceable to irregular fuel delivery. *Petroleum Solvents Corp.*

Reversible Plastic-Coated Glove

5—So constructed as to be worn on either hand, reversible plastic-coated gloves are strong and pliable and are claimed to outwear leather or rubber gloves. Waterproof and flame, corrosion, abrasion, acid and chemical resistant, gloves have non-slip finish and will not crack, scuff or peel. Available in knit-wrists, short-gauntlets and full-gauntlets. *Washington Glove Corp.*

Plastic Patch

6—Vulcrete, a plastic patching and leveling material, can be used as a floor leveler, floor patch, plastic liner, wall seal, sound dampener, joint filler, shock absorber, for acid and alkali resistant bench and table tops, and for many other industrial applications. Vulcrete bonds to wood, metals, concrete and composition surfaces without primer coats, and is quick drying and economical. Available in units consisting of 34 lb of vulcanizer grains and 1 gal of prepared liquid latex, Vulcrete is mixed as needed. *Flash-Stone Co.*

Hydraulic Vise

7—Model 1004 hydraulic vise features heavy 4-in. jaws with maximum jaw pressure of 4,000 lb and maximum hydraulic pressure of 7,000 psi. Simple two-pedal foot control leaves both hands free. Light castings and finished surfaces can be gripped without crushing or marring. *Columbian Vise & Mfg. Co.*

Spur Gear Hoist

8—Challenger, a spur gear hoist available in ½ and 1 ton capacities weighs only 30½ lb, allowing it to be moved freely from place to place. Formed steel plate in housing gives unit high strength and unusual resistance to shock-load breakage. All load holding parts are of high-strength steel that will hold five times rated capacity of hoist. Challenger may be disassembled in a matter of minutes with simple tools. *Coffing Hoist Co.*

(Continued on Page 80)

Reader Service (NOVEMBER/51)

AMERICAN FOUNDRYMAN

Please send me detailed information on New Foundry Products and Foundry Literature items circled below.

NAME________________ TITLE________________

COMPANY________________________________

ADDRESS________________ CITY________________

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Reader Service

AMERICAN FOUNDRYMAN

616 S. Michigan Avenue

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FOUNDRY *Literature*

For additional information on Foundry Literature use postcard at bottom of this page.

Materials Handling

9—24-page booklet, "The How Book of Cost Cutting Materials Handling," is a revised version of a 1947 book and is largely concerned with basic background material on types of skids, pallets and other industrial handling tools. Balance of book covers a comprehensive plan for evaluating present handling methods through an engineering analysis. Charts and summary sheets are provided for making a materials handling analysis. *Yale & Towne Mfg. Co.*

High Temperature Data

10—Work sheet is designed to facilitate inquiries on specific high-temperature applications of metals and alloys. When user writes for work sheet, he fills it in and forwards it for answer by International Nickel Co.'s Development and Research Division, whose files cover service records and results of plant and laboratory tests on (1) possibilities of corrosion at high temperature of metals, (2) performance to be expected from various metals and alloys under varying conditions and applications, and (3) substitutes for metals and alloys at present not available or in short supply. *International Nickel Co.*

Largest Molding Machine

11—4-page illustrated catalog No. 2500 contains detailed information and specifications on Model 2364 jolt-squeeze-strip molding machine, claimed to be the largest made. Also described is complete line of Spo jolt-squeeze-strip machines in capacities from 1500 to 4000 lb, with semi-automatic pushbutton control. Complete cycle of machines is outlined, plus capacities, dimensions, pattern draw and other information. *Spo, Inc.*

Sand Preparation Unit

12—Bulletin 507 describes the Simpson Utility Unit, a sand preparation unit designed to give smaller foundries the advantages of a "packaged" preparation unit. Machine is designed to provide high quality sand at a low cost and is claimed to reduce manpower required for sand preparation by as much as 50 per cent. *National Engineering Co.*

Milling Tools Catalog

13—12-page catalog describes complete line of DoALL milling cutters, slitting saws, end mills, shell end mills, keyseat cutters and T-slot cutters. Included is price data and descriptive information on selecting of proper milling tools, helpful tips on regrinding, increasing tool life with soluble oils, and information on special cutters. *DoALL Co.*

Conveyor Equipment

14—Bulletin No. 51-81 contains information on latest designs in conveyor idlers and machinery, and includes two pages of general engineering information designed to help in specifying belt idler equipment. Also given is a detailed description of zipper bunker seals, data on belt conveyor trippers, and information on correct maintenance procedures. *Chain Belt Co.*

Cast Alloy Tools

15—Useful data on cast alloy metal-cutting tools is contained in 44-page tool manual and catalog. Booklet describes four grades of cast cutting tool alloys and gives the physical, mechanical and chemical properties of each to help in selecting

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Reader Service (NOVEMBER/51)

AMERICAN FOUNDRYMAN

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the right tool for every operation. Illustrating the booklet are tables on cutting angles, speeds, feeds and depth of cut. One table gives ratings for more than 60 alloys and alloy steels. Methods for grinding tools and brazing tipped tools are also discussed. *Haynes Stellite Co., A Division of Union Carbide & Carbon Corp.*

Specimen Cut-Off Machines

16—Folder describes complete Buehler line of specimen cut-off machines. Five models are available for samples from ½ to 3-in. in diameter. *Buehler, Ltd.*

Shell-Molding Process

17—"What You Should Know About the New Shell Molding Process" is the title of an 8-page illustrated booklet that traces the development of shell-molding, formerly known as the "C" Process, from its beginning in wartime Germany, and explains its uses and advantages, such as precision casting at green sand casting costs, greater production, less space needed, and savings in metal, sand handling and conditioning and labor. Pamphlet gives detailed information on shell molding equipment, temperatures, and avoiding overcuring, excessive moisture and inadequate mixing. *Chemical Division, Borden Co.*

Foundry Compound Specifications

18—8-page booklet provides a handy reference guide to all Houghton products meeting government specifications in the following classes: rust preventives, lubricants, metalworking aids, cutting oils and leather and synthetic rubber products. Listing includes specification number, name and description of each product. *E. F. Houghton & Co.*

Ultrasonic Testing

19—Commercial ultrasonic testing services for foundries and allied metal fabricating industries are described in Bulletin 50-115. Outlined is a field service which provides day-to-day testing at customer's plant or other designated location by a qualified engineer equipped with a Reflectoscope, Reflectogage, or both. Also available is a laboratory service for products that can be shipped to company headquarters for testing. Reflectoscope locates discontinuities in metals as far as 40 ft from test surface. Reflectogage measures thickness of metals up to 4 in. *Sperry Products, Inc.*

Welding Accessories Catalog

20—16 page catalog gives specifications, applications and advantages of complete line of Hobart arc welding accessories and supplies. *Hobart Brothers Co.*

Government Specification Finishes

21—Booklet lists almost all U. S. Government Specification Finishes for metals and other products. Given are the Specification Code Number, complete ingredient detail and drying periods required between applications. *Egyptian Lacquer Manufacturing Co.*

Industrial Magnets

22—12-page catalog describes entire line of Dings magnetic separators and lifting magnets, tells which magnets to use to remove iron from wet or dry materials on conveyor belts, chutes and ducts. Also described are units for magnetic concentration and purification, etc. *Dings Magnetic Separator Co.*

Tumbling Abrasive

23—55-page illustrated booklet, "Barrel Finishing with Alundum Tumbling Abrasive," gives properties and advantages, and describes complete barrel finishing process. Listed are equipment, cleaners, rust preventives, and such procedures as roughing, finishing, separation, washing, drying, etc., and a section on practical hints to operators. *Norton Co.*

Fork Trucks

24—8-page specification bulletin No. 1326 includes complete information on advantages and applications of Baker Type FC fork trucks. Bulletin contains dimension drawings, detailed specifications and action photographs. *Baker-Raulang Co.*

Heat-Resistant Paints

25—Bulletin gives application product data for five Speco heat-resistant paints: Heat-Rem (Standard) Aluminum; Heat-Rem H-170 Extra High Heat Aluminum, "M" Aluminum for moderately hot surfaces, "HSE" (hot surface elastic) Black and "QD" (quick drying) Black. *Speco, Inc.*

CHAPTER ACTIVITIES

(Continued from Page 79)

said, can be accomplished by doing each part of the job correctly rather than by looking for new developments or "cure-alls" such as deciding on the method of molding before the pattern is made so that the pattern will be suited to the molding; having flasks of correct size and in good condition; and paying a higher price if necessary for sand having properties required for the job.

Ontario

G. L. White
B. L. Smith Publishing Co., Ltd.
Publicity Chairman

Annual Picnic of the Chapter was held again this year at Rolph Barnes' estate near Waterdown, Ont., and was one of the most successful in Chapter history. Some 235 foundrymen played golf and horseshoes, shot at targets and participated in an egg throwing contest.

Following supper prizes were awarded to winners of the events.

Missouri School of Mines

Jack H. Thompson
Chapter Reporter

October 9 meeting featured a talk by National Director A. L. Hunt, National Bearing Division, American Brake Shoe Co., chairman of the FEF Advisory Committee to the School, on opportunities for young engineers in the foundry industry.

Mr. Hunt mentioned training programs offered by some companies and the unlimited chances for advancement in this field. He added that the foundries are interested not only in metallurgical engineers, but in any type of engineer who is sincerely interested in this field. He also reminded the students of the encouragement and assistance offered men through Foundry Educational Foundation scholarships and assistance in securing summer employment.

Dr. A. W. Schlechten, chairman of the Metallurgical Engineering Department at MSM, introduced Mr. Hunt and gave a short talk on the history of the MSM foundry. In his talk he mentioned that the A.F.S. student chapter at MSM is the largest in the country and the second oldest.

Dr. Schlechten also reported on progress in expanding and setting up new equipment in the newly acquired space for the Foundry Laboratory.

Birmingham District

J. P. McClendon
Stockham Valves & Fittings, Inc.
Publicity Chairman

Largest and most enthusiastic crowd ever to attend an Annual Outing of the Chapter was on hand September 15 to greet old friends and make new ones. Secretary-Treasurer John Drenning, Kerchner, Marshall & Co., reported that more than 900 tickets were sold to foundrymen from all over the South.

Refreshment Chairman William Bach, Foundry Service Co., and his helpers worked hard and long, from 11:00 a.m. to 4:00 p.m., when the cooler was empty. The menu provided plenty of barbecued chicken and ribs, potato salad, slaw, and trimmin's.

Sports program included horseshoe pitching and softball, while a main feature of the event was the awarding of some 50 prizes.

On the Annual Picnic Committee and responsible for its success were Co-Chairmen Elliott M. Cranford and J. T. Gilbert of Stockham Valves & Fittings, Inc., and Grover C. Arnwine, Alabama By-Products Corp.; William Bach, Foundry Service Co.; T. H. Benners, T. H. Benners & Co.; Ernest C. Finch and Gene Whelchel, American Cast Iron Pipe Co.; Henry Guthrie, DeBardeleben Coal Corp.; Morris L. Hawkins, Stockham Valves & Fittings,

Inc.; and Ben Spann, National Cast Iron Pipe Co. Sergeant-At-Arms was Fred C. Barbour, McWane Cast Iron Pipe Co.

Visitors from the A.F.S. Tennessee Chapter included Chairman Porter Warner, Jr., Vice-Chairman W. M. Hamilton, Secretary-Treasurer R. E. Kirchmayer, Allison Caldwell, Fred McGee, Charles Saunders and T. A. Johnston.

Oregon

Norman E. Hall
Electric Steel Foundry Co.
Publicity Chairman

Initial meeting was held in the Georgian Room, Heathman Hotel, Portland, September 19, with a large turnout of members.

Following introductory remarks Chairman E. J. Hyche, Rich Manufacturing Co., outlined the program for the year and named the following committeemen to assist chapter officers in handling activities: *Membership Chairman*, Norman Rupp, assisted by Loren Bacon, both of Carborundum Co.; *Entertainment Chairman*, Louis LaGrand, LaGrand Industrial Supply Co., assisted by J. T. Dorigan, Electric Steel Foundry Co.; *Publicity Chairman*, Norman E. Hall, Electric Steel Foundry Co.; *Arrangements Co-Chairmen*, Vince Belusko and Johnny Peterson, both of Electric Steel Foundry Co.

Speaker of the evening was Warner B. Bishop, Foundry Products Div., Archer-Daniels-Midland Co., who spoke on *"Core Practice Control."*

Mr. Bishop stressed the importance of moisture control and sequence of mixture in coreroom operations. Following this informative talk the film, *"The A-D-M of Cores,"* prepared by the Archer-Daniels-Midland Co., was shown.

The film clearly demonstrated points stressed by Mr. Bishop and showed a great amount of research in the study of cores and coreroom problems. Also brought out were the effects of various types of sand and binders on cores.

Quad City

Widespread interest in the newest in foundry developments was evident at the October meeting, when W. F. Rose, Borden Co., New York, spoke on *"Recent Developments in Shell Molding."* More than 125 members and guests attended the meeting at the Fort Armstrong Hotel, Rock Island, Ill., October 15.

Mr. Rose outlined methods used in producing shell molds and brought out the disadvantages as well as the advantages of the process.

The numerous possibilities and advantages of shell molding in the core room were also emphasized. On display at the meeting were shells and castings produced by this method. The discussion period was also of great interest to those in attendance.

The presence of a larger number of guests than usual from other chapters and from more distant foundry centers indicates wide interest in the subject.

Theodore Burkland, of Deere & Company, was Technical Chairman.

Washington

Harold R. Wolfer
Puget Sound Naval Shipyard
Chapter Reporter

September meeting, held at the Frye Hotel, Seattle, had as its speaker Warner B. Bishop, Foundry Products Division, Archer-Daniels-Midland Co., Cleveland, who supplemented his talk on *"Core Practice Control"* with a showing of the film *"The A-D-M of Cores."*

Mr. Bishop stressed the importance of knowing and controlling moisture content of core mixes. Experiments carried on by basic research into core problems indicates that moisture content of 1 to 2 per cent in a core mix containing only core oil, sand and moisture, will develop 100 per cent of the green strength inherent in the mix.

Further, moisture in this amount will develop 50 per cent of the baked

strength which the mix is capable of developing. To illustrate, a mix containing 1 per cent oil and 1 per cent moisture and no cereal developed a baked strength of 170 pounds, whereas a similar mix containing no moisture produced a baked strength of 250 lb.

When cereal is included in the mix, ½ per cent moisture with 1 per cent oil and 1 per cent cereal produced 3 pounds green compressive strength, Mr. Bishop reported. When moisture was increased to 1-½ per cent, this mix produced 7 pound green compressive strength. Further increase of moisture to 5 per cent gave a green compressive strength of 5 pounds. Generally speaking, Mr. Bishop said, a ratio of 1 part cereal to 2 parts moisture gave the best green strength.

Tests showed that a cereal-to-moisture ratio of 1 to 4 produced the best baked strength (185 pounds with 1 per cent moisture; 285 pounds with 3-½ per cent moisture; and only 240 pounds with 6 per cent moisture.)

Mr. Bishop also stressed the importance of control in baking cores. Experiments indicated that a baking temperature of 425F gave best results. He illustrated this point with strength curves plotted time versus temperature. These showed, for a baking temperature of 475F, a rapid climb of maximum strength and a sharp drop with increased baking time, indicating a sharp loss of strength from over-baking if time is not accurately controlled. A baking temperature of 425F produced slightly lower maximum baked strength, but produced satisfactory strengths over a greater range of baking time cycles.

As to sequence of mixing materials in core mixes, Mr. Bishop reported experiments showed best green compression and baked strength when a sequence of dry mixing, water addition and oil last was adhered to. Standardizing of mixing procedure once established is the important thing, he said.

Central Indiana

Paul V. Falk
Electric Steel Castings Co.
Chapter Reporter

October 6 meeting, held at the Athenaeum Turners Hall, drew a crowd of 120 foundrymen to view the A.F.S. sound-color research film, *"Fluid Flow in Transparent Molds—II."* Providing a running commentary on the film and leading discussion of the film's principal points was A.F.S. Technical Director S. C. Massari.

Chapter's Annual Picnic on September 15 was attended by more than 300 members and guests, who pitched horseshoes, played softball, ate a delicious dinner, and renewed old foundry friendships.

Eastern Canada Chapter Chairman W. Turney Shute (standing) opens the chapter's first meeting of the season. Seated is Speaker C. V. Nass, Pettibone Mulliken Corp., Chicago, who narrated a film on mechanization of molding.

Central Ohio

Wilfred H. White
Jackson Iron & Steel Co.
Chapter Reporter

Speaker at the October 8 meeting, held at the Chittenden Hotel, Columbus, was Richard Herold of the Borden Co., New York, who spoke on *"Shell Molding and Plastic Binders."*

Mr. Herold in discussing the fundamentals of shell molding explained that it has been used successfully in casting metals to such close tolerances as .002-.003 in. The process yields castings which require little or no cleaning or machining. Since only a shell of sand is used with a plastic binder, there is little material to handle and labor is reduced to a minimum, he said.

The speaker emphasized that the process is new and improvements are being made all the time. Technology of sands, binders and back up materials is improving. Proper baking of molds is very important. Difficulties have been encountered in this but these are gradually being eliminated.

Mr. Herold believes that shell molding holds great promise and that by this means foundries may recapture work which has been lost to other means of fabrication.

A short movie of the Central Ohio Picnic was presented by Wilfred H. White, Jackson Iron & Steel Co., Jackson, Ohio.

The Chapter is scheduled to sponsor a television program Sunday, November 18, as part of the Columbus Technical Council's *"Engineering Is Your Life"* series over Station WBNS-TV. The Chapter's program will tell the public of the vital role castings play in everyday living and will be scripted and directed by H. W. Lownie of Battelle Memorial Institute.

COMMITTEES

(Continued from Page 62)

held by the Plant & Plant Equipment Committee during the 1952 International Foundry Congress.

As planned by the Committee, which met October 11 in Chicago, outline of the tentative Symposium will be (1) Introduction, (2) Plain jolt and jolt squeeze molding machines—arm draw devices and hand squeezers, etc., (3) Jolt squeezers for cope and drag work—pin lift, rail strippers, jolt squeeze roll over draw, (4) Rockover draw jolt machines and jolt—pin push off machines, (5) Sand slingers, pattern draw and (6) Special and automatic machines.

Second Plant & Plant Equipment Session at the 1952 International will feature showing of the film, "Mechanization in Molding," courtesy of Beardsley & Piper Div., Pettibone Mulliken Corp.

In attendance were Chairman James Thomson, Continental Foundry & Machine Co., East Chicago, Ind.; Vice-Chairman H. W. Johnson, Wells Mfg. Co., Skokie, Ill.; K. M. Smith, Caterpillar Tractor Co., Peoria, Ill.; H. C. Weimer, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago; O. F. Weiss, Milwaukee Foundry Equipment Co., Chicago; and A.F.S. Technical Assistant Jos. E. Foster.

A.F.S. Educational Division Executive Committee

CONVENTION and A.F.S. Apprentice Contest plans were chief topics at the October 5 meeting of the Educational Division's Executive Committee.

Planned for the Division's Tuesday, May 6, Convention session is a paper on *"Management's Responsibility in the Training Program."* Also tentatively scheduled for May 6 is the International Educational Dinner, with an international authority as speaker.

A.F.S. 1952 Apprentice Contest drawings are completed and in process of reproduction. Metal and wood patterns are also in their final stages. Material will be sent to A.F.S. Chapters in the near future. Judging this year will be conducted at the University of Illinois, Navy Pier Branch, Chicago.

A.F.S. Educational Division's high school foundry textbook will be off the presses shortly. Contemplated is use of a series of Institute of British Foundrymen apprentice training lectures, as an outline for an apprentice-level text.

Attending were: Chairman G. J. Barker, University of Wisconsin; W. H. Ruten, Brooklyn Polytechnic Institute, Brooklyn, N. Y.; Roy W. Schroeder, University of Illinois, Navy Pier Branch, Chicago; Frederick G. Sefing, International Nickel Co., New York; Earl M. Strick, Erie Foundry Co., Erie, Pa.; and Technical Director Massari.

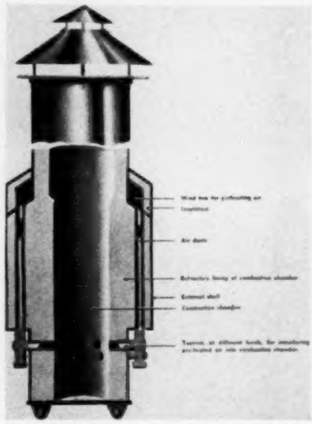
NEW PRODUCTS

(Continued from Page 81)

FOR FURTHER INFORMATION ON NEW FOUNDRY PRODUCTS LISTED HERE USE CONVENIENT POSTCARD ON PAGE 81.

Self-Preheating Cupola

26—Trumelt, a cupola designed to preheat its own air, is in the same price range as a conventional cupola. Blower forces air into a windbox near top of combustion chamber for preheating. Air absorbs heat normally dissipated through cupola shell. Hot air is then forced down



through insulated ducts into tuyeres leading into combustion chamber. Tuyeres are placed at different levels to insure uniform flow of heated air and help prevent bridging in combustion chamber. One user reports a coke ratio of 18 to 1, and manufacturer claims castings made with Trumelt require a third less machining time. *North State Pyrophyllite Co.*

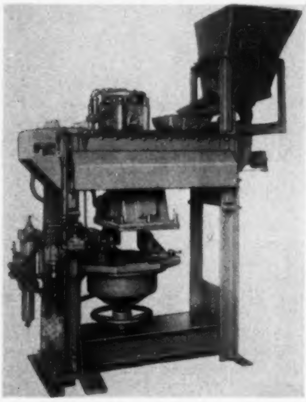
Metallizing Guns

27—Two metallizing guns, Type 4E for machine element work, and 5E for corrosion protection coatings, are claimed to develop highest spraying speeds for hand-held guns. Guns incorporate jet siphon principle in gas head to compensate automatically for variations in gas pressure as high as 10 lb, providing steady, unvarying

flame and uniform coatings at low cost. Type 4E gun sprays all wires from 20 B&S gage to 1/4 in. in any metal at speeds up to 40 per cent faster than previous models. Type 5E is designed for high-speed spraying of such softer metals as zinc and aluminum for corrosion protection that lasts from 20 to 30 years. Type 5E gun sprays 3/16-in. wire and will deposit 55 lb of zinc or 15 lb of aluminum per hr. *Metallizing Engineering Co.*

Vibratory Sand Feeder

28—Vibratory sand feeder for chute or dump bucket loading is designed to eliminate "time out" periods usually required in loading sand. Non-clogging, unit provides a completely automatic flow of sand into the core blower. Sand is delivered in ideal blowing condition, even after it has been stiff enough for packing in "snow balls." Feeder requires no operator attention once it has been timed with core blower cycle. Unit is powered by two comparatively noiseless rotary vibrators and is available in 4 cu ft capacity for chute loading, and in 6 cu ft capacity for dump bucket loading. Sides of storage hopper can easily be extended for increased capacity. *Wm. Demmler & Bros.*



Quench Tank

29—Constant level, recirculating quench tank is designed to receive work from a mechanical loader, removing entire load from furnace and quenching it in one operation. Tank cools as it circulates quenching liquid. Airflow circulator can be added to make unit useable with more than one furnace. Unit includes main quench tank, reserve and cooling tank, pump and motor. Dimensions are 30-in. wide, 42-in. long, 30-in. deep. Operates on 1/4 hp, 110 volt, single-phase motor. *A. D. Alpine Co.*

Vibrator

30—New line of "Quiet-Type" Style EM Vibrators are available in 1 1/4 to 4 in. piston sizes and weights from 9 to 140 lb for preventing arching, sticking, hanging-up in bins, hoppers and chutes. Air-cushioned impact prevents metal-to-metal pounding, eliminating bolt breakage, increasing vibrator life, and producing quiet operation. *Cannon Vibrator Co.*

FOUNDRY FIRM *Facts*

Hamilton Foundry & Machine Co., Hamilton, Ohio, held its Seventh Annual Service Pin Dinner September 18. Three new "old timers" were inducted into the club, bringing the total of 25-year employees to 22. They are Hughie Robinson, utility man; Vernon Diefenbacher, customer service supervisor; and Foundry Foreman Homer Harbin.

Precision Metalsmiths, Inc., announces removal of its offices and factory to a new location at 1081 East 200th St., Cleveland 17, Ohio. The new facilities will permit an increase of 400 per cent in the company's present output of precision castings and in its ferrous and non-ferrous research and consultation services.

Israel Government Investment Center claims that conditions are favorable for establishment in Israel of three iron foundries and integrated non-ferrous industrial units requiring $6 million capital, half of which is to come from foreign sources. Each of the proposed foundries would have a casting capacity of 12 ton per shift, aggregating 11,000 ton yearly. In non-ferrous field, according to the Center's recent survey, an integrated setup, including a smelting plant, rolling mill and general-purpose foundry, is needed.

Osborn Mfg. Co., Cleveland, has appointed Inesco, Inc., as its exclusive representative for its line of foundry molding equipment in California. Inesco, Inc.'s president is Otto H. Rosentreter, formerly West Coast sales manager for the National Engineering Co. of Chicago.

Harbison-Walker Refractories Co. through a wholly owned subsidiary is acquiring the Warm Springs, Calif., plant of **LaClede Christy Co.**, Chicago, permitting Harbison-Walker to expand its basic refractories and silica refractories production. The Warm Springs plant was formerly used to manufacture tank blocks and other specialties for glassmaking. Also announced by Harbison-Walker is formation of a wholly owned Brazilian subsidiary, **Harbinson-Walker Minerios Ltda.**, which has acquired exclusive mining rights to large deposits of pure magnesite in Brazil.

Link-Belt Co., Chicago, has opened a new factory branch store at 108 South Fourth West St., Salt Lake City 1, Utah. Heading the new office is District Manager Donald W. Newsome, who will be assisted by Harry Hotchkiss. The office will serve Utah, southern Idaho and eastern Nevada.

Continental Foundry & Machine Co., East Chicago, Ind., plans a 22,000 sq ft addition to its plant. The company recently placed a 20-million volt betatron in operation at East Chicago for production line inspection of heavy ordnance equipment, and a similar unit is being installed at its Coraopolis, Pa., plant.

Chase Brass & Copper Co., Waterbury, Conn., is celebrating its Diamond Anniversary this year. The **Waterbury Mfg. Co.**, first unit of the present Chase organization, was founded in January, 1876. Since then the company has expanded to include the **Chase Rolling Mill**, the **Noera Mfg. Co.**, the **Chase Metal Works** and the **U. T. Hungerford Brass & Copper Co.**

American Cyanamid Co., in line with its new national policy of consolidating its offices and warehouses in large cities, has combined its several Los Angeles offices and warehouses in one new building at 2300 S. Eastern Ave., Los Angeles.

Automatic Transportation Co., Chicago, announces opening of a factory branch and sales office at 1336 Fairfield Ave., Bridgeport, Conn., serving the southeastern part of that state.

Pangborn Shows How Cleaning, Dust Collecting Equipment Is Made And Used

Some 5,000 townsfolk joined editors of metals magazines at Pangborn Corp.'s (Hagerstown, Md.) open house September 26 in witnessing manufacturing methods used in producing the company's blast cleaning and dust control equipment. Operated before an audience for the first time at Pangborn's first full-scale open house was the new 58 x 61-ft demonstration room (left) which houses experimental and stock models of equipment made by the company. The demonstration room permits potential users of blast cleaning and dust control equipment to process samples of their products and to see equipment in action before deciding which is the best unit for their particular application. During the open house, visitors were led through the entire plant by specially trained guides who showed and described over 60 points of interest in the manufacturing as well as "white-collar" departments. All departments were in full operation. The trip started with a free bus ride from downtown areas for those without transportation and ended with refreshments "on the house" in nearby Pangborn Park. One of the high spots of the visit was the foundry (right) where visitors saw gray iron castings produced in a roomy, orderly shop marked by good housekeeping and clean air.

This 20-million volt betatron is now in operation at Continental Foundry & Machine Co.'s East Chicago, Ind., plant for production line inspection of heavy ordnance. Betatron will detect flaws as small as 0.02 in. in castings up to 24-in. thick. Similar unit is being installed at Continental's plant in Coraopolis, Pennsylvania.

Blue Magic Chemical Specialties Co., a newly formed organization for the manufacture of barrel finishing compounds, is located at 2135 Margaret St., Philadelphia.

Safety Clothing & Equipment Co., has moved its plant from 7016 Euclid Ave. to 1990 E. 69th St., Cleveland. Company's new telephone number is HEnderson 2-0400.

Reading Foundrymen Hear E. C. Troy

A.F.S. National Director E. C. Troy, foundry engineer, Palmyra, N. J., was the featured speaker at the September 18 meeting of the Reading Foundrymen's Society, it is reported by the Society's technical secretary, Joseph L. Grenko.

Foundrymen, Mr. Troy recommended, must (1) know and serve their industry, (2) know their plant limitations, and (3) be more receptive to new processes. This can be done only through foundry technical organizations and interchange of technical knowledge, he said.

Among recommendations made by the speaker were: an investment of more money per molder; improvement of safety and hygiene in the foundry; an overall research program for the industry: installation of accurate cost systems; and consultation with employees and supervisors to determine faults in foundry operation.

Relationship between customer and foundry would be greatly improved, Mr. Troy said, if core prints and the use of wood or metal patterns were standardized. Another thing is to make the casting as the customer wants it, and not always try to simplify it. Quality castings delivered at the agreed time are the foundry's best salesmen, Mr. Troy concluded.

PERSONALITIES

(Continued from Page 65)

J. Morgan, who since his resignation in August as chief metallurgist for Magnal Products, Ltd., Bristol, England, has been with Foundry Services, Ltd., Birmingham, England, familiarizing himself with the company's products and organization, has been appointed chief metallurgist at the Guelph, Ont., plant of Foundry Services (Canada), Ltd. Another newcomer to Foundry Services, Ltd., **M. W. Barlow**, formerly sales manager of British Electro Metallurgical Co., Ltd., Sheffield, England, has been named manager of the company's newly established Ferro Alloys Division.

Lt. Harry R. Dahlberg, USNR, has left Twin City Testing & Engineering Laboratory, St. Paul, Minn., to rejoin the Navy. Now in Washington, D. C., he is with the Industrial Survey Section, Management Control Branch, Bureau of Ordance. He was supervisor of the mechanical and metallurgical department for Twin City Testing & Engineering.

Carl E. Swartz has resigned as chairman of the Metals Research Department of Armour Research Foundation, Illinois Institute of Technology, Chicago, but will continue with the Foundation as metallurgical consultant. Succeeding Dr. Swartz will be **Max Hansen**, formerly assistant Department chairman. **R. A. Lubker** has been promoted to associate chairman of the Metals Research Department and will assist Dr. Hansen in metals research work for A.F.S. and other technical organizations.

Dan R. Babbitt, Midwestern Division manager for Electric Steel Foundry Co., has assumed additional duties as manager of the company's Danville, Ill., plant, succeeding **C. P. Siefarth**, who has retired. The company's Chicago office will be in charge of **Harry Ratkowski**, while at Danville Mr. Babbitt will be assisted by Office Manager **Lloyd Payne** and Plant Superintendent **Dale P. Minyard.**

Arthur N. Dugan, vice-president of American Brake Shoe Co.'s National Bearing Division, has retired after 37 years' service, but will continue his connection with the Division as consultant. He was named vice-president of National Bearing Metals Corp. in 1927, retaining his title when Brake Shoe took over that company. Also announced by the Division is the transfer of **Pearce D. Smith** from Pittsburgh sales office to Brake Shoe's company headquarters in New York.

Wendell C. Peacock, one of five founders of Tracerlab, Inc., Boston, in 1946, was recently elected vice-president, technical director and a member of the company's Board of Directors. Tracerlab makes x-ray equipment and equipment for using radioactive tracers in the foundry.

Dennis Ord has joined Sam Tour & Co.'s Research and Development Laboratories, New York, where he will specialize in chemical analysis of titanium and its alloys. A Canadian, Mr. Ord served in the Canadian Navy in World War II, and

with that government's Naval Research Establishment at Halifax, Nova Scotia.

Fred R. Grassle, secretary of Hills-McCanna Co., Chicago, will assume additional duties as assistant to President **C. A. Howe. R. T. Kidde** has been named sales manager of the company's several divisions, including its magnesium foundry.

OBITUARIES

C. L. Best, 73, chairman of the Board of Directors and a member of the Executive Committee of Caterpillar Tractor Co., Peoria, Ill., died September 22 in San Francisco. A pioneer manufacturer of farm machinery, Mr. Best began in 1891 as a helper in his father's farm implement factory, becoming superintendent by the time his father sold the business in 1910. He then opened his own factory at Elmhurst, Calif., for making gasoline tractors, continuing as president until 1925 when his company and the Holt Tractor Co. were merged to form Caterpillar Tractor Co. He then became chairman of the Board of Caterpillar, a position he held until the time of his death. Mr. Best was the only holder of the Caterpillar 50-year pin.

Newlin T. Booth, 65, president of the Deemer Steel Casting Co., New Castle, Del., died September 19 at his home in that city. Holder of an A.B. from Swarthmore College in 1907, Mr. Booth entered the foundry industry that same year as a chemist with the Pennsylvania Steel Casting & Machine Co., Chester, Pa. In 1923, Mr. Booth left his position as superintendent of Bethlehem Steel Corp.'s Steelton, Pa., foundry to become president of Deemer Steel Casting Company.

C. S. Blackburn, 59, sales manager for Buckeye Foundry Co., Cincinnati, died August 9 of a heart attack. Mr. Blackburn had been with Buckeye Foundry Co. since 1935, and before that with Morris Foundry Co. of Cincinnati.

DETERMINATION—

(Continued from Page 43)

beanic acid makes it possible to determine small amounts of this element without the need of a preliminary separation. The procedure was adapted from a somewhat similar method used for copper in steel by W. L. Miller, I. Geld, and M. Quatinetz of this laboratory. Rubeanic acid reactions have been well described by Willard and Diehl.[2]

Results for copper and bismuth obtained from synthetic samples are shown in Table I. Willard, Mosher, and Boyle[3] state that bismuth causes low results in developing copper rubeanate color. However, the present authors found no significant interferences from small amounts of bismuth in lead.

References

1. *A.S.T.M. Methods of Chemical Analysis of Metals,* American Society of Testing Materials, Philadelphia, 1946.

2. H. H. Willard and H. Diehl, *Advanced Quantitative Analysis,* D. Van Nostrand Co., New York, 1943.

3. H. H. Willard, E. M. Mosher, and A. J. Boyle, *Analytical Chemistry,* 21, 598 (1949).

FUTURE MEETINGS & EXHIBITS

- **Nov. 15—AFS Washington Chapter,** Frye Hotel, Seattle, Ralph L. Lee, Grede Foundries, Inc., Milwaukee, *"Do You Know Your Costs?"*
- **Nov. 16—AFS Tennessee Chapter,** Hotel Patten, Chattanooga, Ray A. Witschey, A. P. Green Fire Brick Co., *"Foundry Refractories."*
- **Nov. 18—AFS Texas Chapter,** Adolphus Hotel, Dallas, film and panel discussion, *"Fluid Flow in Transparent Molds—II."*

Nov. 19-20—National Metal Trades Association, Palmer House, Chicago.

- **Nov. 20—AFS Eastern New York Chapter,** Circle Inn, Lathams, N. Y., Clyde B. Jenni, General Steel Castings Co., *"Sand."*
- **Nov. 23—AFS Ontario Chapter,** Prince Edward Hotel, Windsor, Ont., *"Statistical Quality Control in Foundries."*
- **Nov. 30—AFS Chesapeake Chapter,** Engineers' Club, Baltimore, F. G. Sefing, International Nickel Co., *"The Trainee, the Journeyman, and the Engineer in the Foundry Industry."*
- **Dec. 3—AFS Western Michigan Chapter,** Cottage Inn, Muskegon, Mich., Donald Colwell, Apex Metal Co., subject to be announced, and George W. Cannon, *"Trends of European Foundries Today."*
- **Dec. 3—AFS Central Indiana Chapter,** Athenaeum Turners Hall, Indianapolis, Walter Bonsack, Christiansen Corp., Chicago, *"Metallurgy of Alluminum and Aluminum Foundry Practice."*
- **Dec. 3—AFS Chicago Chapter,** Chicago Bar Association, D. A. Farrell, United States Steel Co., Pittsburgh, Pennsylvania, *"Safety."*
- **Dec. 4—AFS Rochester Chapter,** Hotel Seneca, Rochester, N. Y., Walter F. Bohm, Buick Motor Div., GMC, *"Cupola Operation."*
- **Dec. 5-6-7—AFS Central Michigan Chapter,** Hart Hotel, Battle Creek, Mich., B. P. Mulcahy, Fuel Research Laboratory, Inc., Indianapolis, *"Cupola Operation Course."*
- **Dec. 6—AFS Canton District Chapter,** University Club, Akron, Ohio, C. K. Donoho, American Cast Iron Pipe Co., Birmingham, *"Basic Lined Cupola Practice and Nodular Iron."*

Dec. 6-8—American Institute of Mining & Metallurgical Engineers, Electric Steel Furnace Conference, Hotel William Penn, Pittsburgh.

- **Dec. 7—AFS Texas Chapter,** Student Union Building, Texas A & M College.
- **Dec. 7—AFS Western New York Chapter,** Sheraton Hotel, Buffalo, Joseph A. Gitzen, Delta Oil Products Co., Milwaukee, *"Core Sand Additives."*
- **Dec. 7—AFS Northwestern Pennsylvania Chapter,** Moose Club, Erie, Christmas Party.
- **Dec. 7—AFS Metropolitan Chapter,** Essex House, Newark, Christmas Party.
- **Dec. 8—AFS Central Ohio Chapter,** Brookside Country Club, Columbus, Christmas Dinner Dance.
- **Dec. 8—AFS Central Illinois Chapter,** American Legion Hall, Peoria, Christmas Party.

- **Dec. 10—AFS Michiana Chapter,** Indiana Club, South Bend, Ind., Warner B. Bishop, Foundry Products Div., Archer-Daniels-Midland Co., Cleveland, *"A-D-M of Cores."*

Dec. 10-15—Spanish Iron & Steel Institute, General Assembly, Madrid, Spain.

- **Dec. 12—AFS Toledo Chapter,** Toledo Yacht Club, *"Effective Essentials For Making Good Castings."*
- **Dec. 13—AFS St. Louis District Chapter,** York Hotel, Christmas Party.
- **Dec. 13—AFS Northeastern Ohio Chapter,** Hotel Carter, Christmas Party.
- **Dec. 14—AFS Oregon Chapter,** Heathman Hotel, Portland, Christmas Stag Party.
- **Dec. 14—AFS Ontario Chapter,** Royal Connaught Hotel, Hamilton, Ont, Film Night: J. King, Werner G. Smith, Ltd., *"Cores,"* and C. V. Nass, Beardsley C. Piper Div., Pettibone Mulliken Corp., Chicago, *"Foundry Mechanization."*
- **Dec. 14—AFS Central Michigan Chapter,** Hart Hotel, Battle Creek, Christmas Dinner Dance.
- **Dec. 14—AFS Eastern Canada Chapter,** Mount Royal Hotel, Montreal, Albert F. Pfeiffer, Foundry Pattern Div., Allis-Chalmers Mfg. Co., Milwaukee, *"Co-ordination Function of Pattern Equipment and Castings."*
- **Dec. 15—AFS Central New York Chapter,** Hotel Onondaga, Syracuse, N. Y., Annual Christmas Party.
- **Dec. 18—AFS Eastern New York Chapter,** Circle Inn, Lathams, N. Y., Christmas Party.
- **Dec. 21—AFS Chesapeake Chapter,** Engineers' Club, Baltimore, D. W. Gunther, Westinghouse Electric Co., *"Production Foundry Methods."*
- **Jan. 7—AFS Central Illinois Chapter,** American Legion Home, Peoria, H. M. St. John, Crane Co., Chicago, *"Non-Ferrous Foundry Practice."*
- **Jan. 8—AFS Rochester Chapter,** Seneca Hotel, Columbus, Ohio, T. J. Stanton, Induction Heating Corp., *"Dielectric Core Baking."*
- **Jan. 10—AFS Northeastern Ohio Chapter,** Upton Close—news analyst.

Jan. 18—Malleable Founders' Society, Annual Meeting, Cleveland.

- **Jan. 26—AFS Western New York Chapter,** Sheraton Hotel, Buffalo, Ladies Night.
- **Feb. 1—AFS Western New York Chapter,** Harry Kessler, Sorbo-Mat Process Engineers, *"Gating and Risering."*
- **Feb. 5—AFS Rochester Chapter,** Seneca Hotel, Columbus, Ohio, Westley C. Stott, A. P. Green Fire Brick Co., *"Refractory Materials for the Foundry Industry."*
- **Feb. 7-8—AFS Wisconsin Regional Foundry Conference,** Schroeder Hotel, Milwaukee, sponsored by the AFS Wisconsin Chapter and U. of Wisconsin.
- **Feb. 21-22—AFS Southern Regional Foundry Conference,** Tutwiler Hotel, Birmingham, Ala., sponsored by the AFS Birmingham District and Tennessee Chapters and University of Alabama Student Chapter.

March 3-7—American Society for Testing Materials, Spring Meeting, Statler Hotel, Cleveland.

- **May 1-7—AFS International Foundry Congress & Show,** Atlantic City, N. J.

Index to Advertisers

A. F. S. Employment Service

To contact "Help Wanted" or "Position Wanted" advertisers, write to American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5.

In replying to "Help Wanted" advertisements applicants for jobs must send an outline of their experience and background.

HELP WANTED

HW566 — Chief Inspector: in malleable foundry in Midwest. Must be capable of layout work and have some experience in malleable work. State age, experience and salary expected.

HW569—Foundry Superintendent: for shop producing 500 tons carbon and alloy steel, 300 tons electric iron and 150 tons brass pressure vessel castings per month. Must have broad and extensive experience in foundry operations, proven administrative ability and good practical and technical background. Excellent opportunity with long-established company of best reputation. Reply in confidence giving full information as to age, background and experience as well as salary requirements.

HW573—Foundryman: One of the nation's leading research organizations urgently needs an experienced, top-level foundryman for consulting work with small foundries in India. He must know entire operation of small foundries—sand, molding, melting, labor training, and management. One year assignment; carries excellent salary plus all expenses.

HW574—Foundry Superintendent: for large aluminum sand foundry in the Middle West. Must be experienced in foundry operations.

HW575—Metallurgist for U. S. Naval Shipyard on Atlantic Seaboard. Must be capable of conducting x-ray, gamma ray, Magnaflux and Zyglo examinations of castings, weldments and forgings to determine suitability for Navy use. Applicant must possess B.S. in metallurgy or metallurgical engineering and have 6 months professional experience, or have an M.S. in metallurgy or metallurgical engineering.

HW578—Ferrous Metallurgist or Foundry Engineer: man between 25-30 for expanding Midwest research organization. College degree in metallurgy or equivalent necessary. Experience not important. Write stating age, education and salary expected.

HW579—Industrial Engineer: young, some foundry experience. Must be free to travel. College graduate preferred. State qualifications, age and salary

HW580—Time Study Man: young, some foundry experience. Will train suitable applicant. Must be free to travel. State qualifications, age and salary.

POSITIONS WANTED

PW168—Engineer: graduate, 12 years experience in jobbing and production—iron, malleable and steel—equipment planning, construction, plant engineering, methods, rigging, scrap reduction, trouble shooting, supervisory experience in molding, pouring and iron melting. Presently employed. Prefer West or Midwest location.

PW169—Foundry Superintendent: would like part-time position as consultant in setting up Nodular Iron procedure. Considered the expert in this field. Also A-1 foundryman. For information write P.O. Box 21, Bridgeport, Conn.

PROFESSIONAL SERVICES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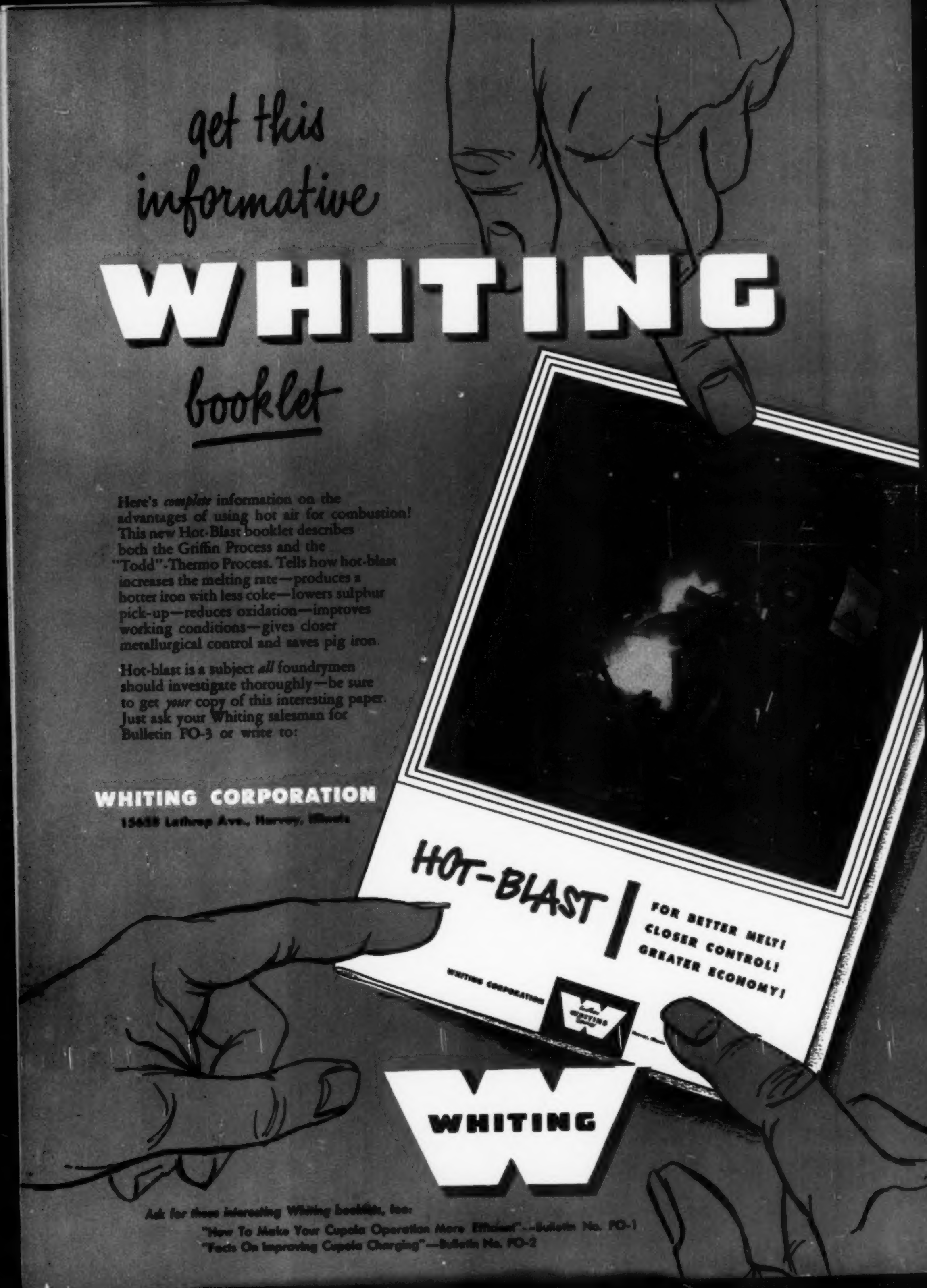
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Here's *complete* information on the advantages of using hot air for combustion! This new Hot-Blast booklet describes both the Griffin Process and the "Todd"-Thermo Process. Tells how hot-blast increases the melting rate—produces a hotter iron with less coke—lowers sulphur pick-up—reduces oxidation—improves working conditions—gives closer metallurgical control and saves pig iron.
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